

## **A Taxonomic Study on Asian *Pheidole* (Hymenoptera, Formicidae): New Synonymy, Rank Changes, Lectotype Designations and Redescriptions**

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**Abstract** Nine previously described forms of Asian *Pheidole* species are synonymized, based on the reexamination of the type materials: *Pheidole attila* Forel, 1913 is synonymized with *P. capellinii* Emery, 1887; *Pheidole exasperata* var. *concordia* Santschi, 1916 and *P. e.* var. *fusiformis* Viehmeyer, 1914, with *P. aglae* Forel, 1913; *P. multicomata* Eguchi, 1999, with *P. comata* F. Smith, 1858; *P. havilandi* var. *sapuana* Forel, 1911 and *P. h.* var. *selangorensis* Forel, 1913, with *P. havilandi* Forel, 1911; *P. huberi* var. *perakensis* Forel, 1911, with *P. huberi* Forel, 1911; *P. nodgii* r. *maxwellensis* Forel, 1913, with *P. magretti* Emery, 1887; *P. treubi* Forel, 1905, with *P. noda* Fr. Smith, 1874. *P. nodgii* var. *tjibodana* Forel, 1905 and *P. sauberi* subsp. *sarawakana* Forel, 1911 are considered to the good biological species. Lectotypes are designated for 31 forms of Asian *Pheidole*. Either redescription or taxonomic remarks are given for each species.

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**Key words** Formicidae, *Pheidole*, Asian species, new synonymy, new status, lectotype designation, redescription

## **INTRODUCTION**

The ant genus *Pheidole* was established for *Atta providens* Syke by Westwood in 1839, and is one of the huge genera in the family Formicidae. Up to the end of 1993, 545 species have been described in the world (Bolton, 1995a), and Brown (2000) estimated its species number at 910. The genus, as a whole, is distributed worldwide in the tropics and warm temperate region (Brown, 2000, Table 5.1), and is one of the prevalent ground-dwelling genera in the world tropics (Ward, 2000), and the species appears to play an important role in the forest ecosystem as omnivores, scavengers and predators of small invertebrates.

Most species of the genus *Pheidole* were described by A. Forel, C. Emery, F. Smith and W. M. Wheeler in the late 19th and early 20th century (Bolton, 1995b). Due to the insufficient information in their original descriptions, more careful examinations of the type materials are usually needed for the

correct identification. Through the reexamination of the type series of the Asian *Pheidole* species, I found a lot of taxonomical problems which should be solved, including synonymies and the change of taxonomic rank. Lectotypes are designated for 31 forms. Either redescription or taxonomic remarks are given for each species. This paper deals with one of my preliminary results toward a revision of the genus *Pheidole* in the Southeast Asia, and is aimed at clearing impeding problems prior to it.

The abbreviations of type depositories are as follows:

BMNH: The Natural History Museum, Cromwell Road, London SW7 5BD, England, UK.

MCSN: Museo Civico di Storia Naturale "Giacomo Doria", Via Brigata Liguria, 9, I-16121 Genova, Italy.

MCZ: Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts 02138, USA.

MHN: Muséum d'Histoire Naturelle, Case Postale 6434, CH-1211 Genève 6, Switzerland.

MNHU: Zoologisches Museum an der Humboldt-Universität zu Berlin, 10115 Berlin, Invalidenstrasse 43, Deutschland.

NHMW: Naturhistorisches Museum Wien, Postfach 417, Burgring 7, 1040 Wien, Austria.

UMS: Universiti Malaysia Sabah, Locked Bag No. 2073, 88999 Kota Kinabalu, Sabah, Malaysia.

The measurements and indices as follows: TL: Total length. Length of out-stretched specimens from mandibular apex to gastral tip. HL: Maximal length of head measured in a straight line from the mid-point of anterior margin of clypeus to the mid-point of posterior margin of head in the minor worker. In the major worker where anterior margin of clypeus and posterior margin of head are concave the measurement is taken from the mid-point of a transverse line spanning the anteriormost or the posteriormost projecting points respectively. HW: Maximal width of head excluding eyes. SL: Length of antennal scape excluding the basal condylar bulb. AL: Length of alitrunk, measured from anterior margin of pronotum to posterior margin of propodeal lobe. PW: Promesonotal width. FL: Length of hind femur. CI: Cephalic index= $HW/HL \times 100$ . SI: Scape index= $SL/HW \times 100$ . FL: Hind femur index= $FL/HW \times 100$ .

## SYSTEMATIC ACCOUNTS

### *Pheidole* Westwood

*Pheidole* Westwood, 1839, An Introduction to the Modern Classification of Insects; founded on the natural habits and corresponding organisation of the different families. Vol. 2. Part XI., London: 219; type species: *Atta providens* Sykes.

The complicated history of taxonomical treatments of the genus-group taxa associated with *Pheidole* was summarized in Bolton (1995b). In this paper I follow his definition of the genus *Pheidole*.

### *Pheidole aglae* Forel

(Fig. 1A–F)

*Pheidole aglae* Forel, 1913, Zool. Jahrb. Abt. Syst. Geogr. Biol. Tiere 36: 32, major, minor and queen; type locality: Bogor, Java. Five syntypes (2 majors and 3 minors, MHN) were examined, of which one major is designated as the **lectotype**.

*Pheidole exasperata* var. *polita* Viehmeyer, 1914, Zool. Jahrb. Abt. Syst. Geogr. Biol. Tiere 37: 606,

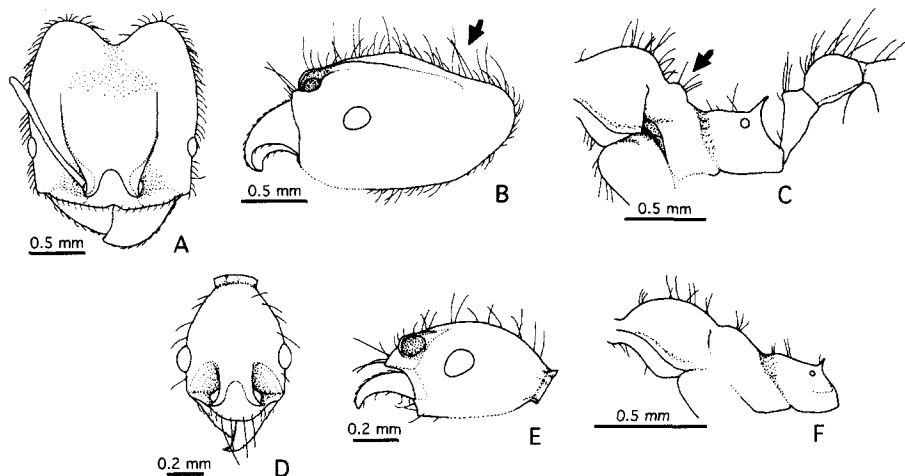
major and minor; type locality: Singapore. The homonymy of *P. e. polita* Viehmeyer with *P. fabricator polita* Emery, 1894 was already established (for the replacement name *concordia*, see Santschi, 1916). Two syntypes (1 major and 1 minor, MNHU) were examined, of which the major is designated as the **lectotype** of *P. e. var. concordia* Santschi (replacement name for *P. e. var. polita*).

*Pheidole exasperata* var. *fusiformis* Viehmeyer, 1914, Zool. Jahrb. Abt. Syst. Geogr. Biol. Tiere 37: 607, major, minor and male; type locality: D. Neuguinea [Irian Jaya]. Revised status as subspecies: Bolton, 1995b. Three syntypes (1 major, 1 minor and 1 male, MNHU) were examined, of which the major is designated as the **lectotype**. **Syn. nov.**

*Pheidole exasperata* var. *concordia* Santschi, 1916, Bull. Soc. Entomol. Fr. 1916: 242. Replacement name for *P. exasperata* var. *polita* Viehmeyer. Revised status as subspecies: Bolton, 1995b. **Syn. nov.**

*Major* (lectotype and paralectotype of *P. aglae*). Measurements: HL 1.75–1.80 mm; HW 1.53 mm; SL 1.15 mm; FL 1.56–1.58 mm; CI 85–87; SI 75; FI 102–103. Head broadest at about 5/8 distance of head (from anterior margin of clypeus to posterior margin of occipital lobe) (Fig. 1A); posterior margin of head in full-face view strongly emarginate; head in profile weakly concave on vertex (arrow in Fig. 1B); anteroventral margin of cranium almost straight, with three inconspicuous median processes. Clypeus without a median longitudinal carina. Eye situated at about 1/3 distance of head. Frontal carina distinct, extending to about 3/4 distance of head (Fig. 1A). Antennal scrobe shallow, running below the frontal carina. Antenna with 3-segmented club; scape extending to about 3/4 distance of head; terminal segment ca. 0.8 times as long as preceding two segments together. Masticatory margin of mandible with apical and preapical teeth, and a denticle in front of basal angle. Promesonotum in profile forming a dome, with a distinct prominence on its posterior declivity (arrow in Fig. 1C). Mesopleuron with an inconspicuous transverse impression. Propodeal spine horn-like, and straight or slightly curved, ca. 3–3.5 times as long as diameter of propodeal spiracle. Petiole in profile cuneiform, ca. 1.2 times as long as postpetiole (excluding helcium); petiolar node in posterior view slightly emarginate at apex. Postpetiole in dorsal view subpentagonal, ca. 2.1 times as broad as petiolar node. Frons longitudinally rugose; vertex, and dorsal and lateral faces of occipital lobe reticulate; promesonotum in dorsal view transversely rugose; mesopleuron and lateral face of propodeum weakly reticulate, with enclosures distinctly punctured; petiole excluding smooth anterodorsal face, postpetiole and anterior part of first gastral tergite weakly or slightly punctured.

*Minor* (paralectotypes of *P. aglae*). Measurements: HL 0.77–0.82 mm; HW 0.53–0.58 mm; SL 1.08–1.17 mm; AL 1.10–1.18 mm; FL 1.20–1.28 mm; CI 69–71; SI 202–204; FI 218–226. Head in full-face view elliptical; occipital carina strongly flanged as a neck (Figs. 1D, E). Clypeus without a median longitudinal carina. Eyes situated just in front of midlength of head. Frontal carina and antennal scrobe present only around antennal insertion. Antenna with 3-segmented club; in full-face view scape extending beyond posterior border of head by more than its 1/3 length; terminal segment 0.7–0.75 times as long as preceding two segments together. Promesonotum forming a dome, with a gentle prominence on its posterior declivity (Fig. 1F). Mesopleuron without a transverse impression. Propodeal spine elongate-triangular, 1.5–2 times as long as diameter of propodeal spiracle. Petiole in profile



**Fig. 1.** Lectotype and paralectotypes of *Pheidole aglae* Forel: A, major, head in full-face view; B, same head in profile; C, same, alitrunk and waist in profile; D, minor, head in full-face view; E, same, head in profile; F, same, alitrunk in profile.

cuneiform, ca. 1.1 times as long as postpetiole (excluding helcium); petiolar node low, in posterior view not emarginate at apex. Postpetiole in dorsal view subpentagonal, ca. 2.0 times as broad as petiolar node. Area between antennal insertion and posterior margin of eye weakly punctured; the remainder of head smooth and shining; promesonotal dome smooth and shining almost over the surface, in dorsal view with several transverse rugae anteriorly; the remainder of alitrunk punctured; lateral face of petiole punctured; the remainder of petiole, and postpetiole and gaster almost smooth and shining.

**Remarks.** *P. exasperata concordia* and *P. e. fusiformis* do not actually belong to *P. exasperata*, but are doubtless local populations of *P. aglae*. In the lectotype (minor) of *P. exasperata* (Mayr) (see below) the head and alitrunk are distinctly punctured. The following slight differences are noticed between the type series of "*P. exasperata* subsp. *concordia*" and *P. aglae*: body of the major larger in the former (e.g. HL 0.98 mm) than in the latter (HL 0.87–0.88 mm); propodeal spine of the major longer in the former than in the latter. And the following differences are present between the syntypes of *P. exasperata* subsp. *fusiformis* and *P. aglae*: head of major shorter in the former (CI 93) than in the latter (CI 85–86); ventrolateral face of major head less rugoso-reticulate in the former than in the latter; mesopleuron and lateral face of propodeum of the major punctured in the former, while rugoso-reticulate, with punctured enclosures in the latter; petiolar node of the major in profile more rounded apically in the former than in the latter; head of the minor almost smooth and shining in the former, while weakly punctured between antennal insertion and posterior margin of eye in the latter. These morphological differences seems to reflect geographical variations.

### ***Pheidole aristotelis* Forel**

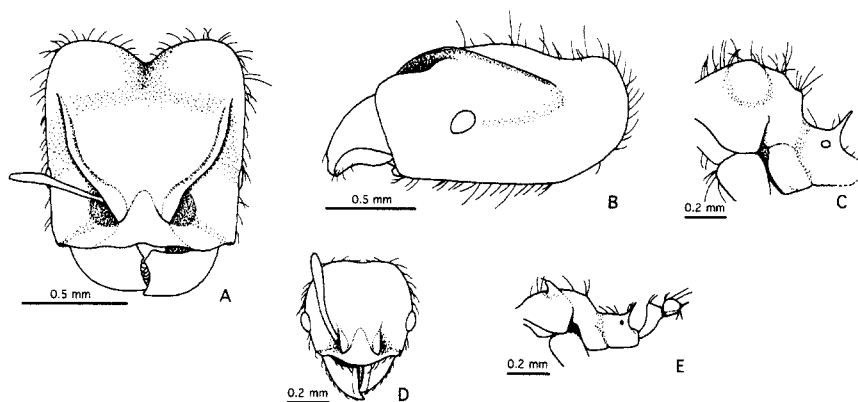
(Fig. 2A–E)

*Pheidole aristotelis* Forel, 1911a, Rev. Suisse Zool. 19: 43, major, minor and male; type locality:

Sarawak, Borneo. Seven syntypes (3 majors, 3 minors and 1 male, MHN) were examined, of which one major is designated as the **lectotype**.

*Major* (lectotype and paralectotypes). Measurements: HL 0.99–1.20 mm; HW 0.94–1.12 mm; SL 0.52–0.57 mm; FL 0.60–0.65 mm; CI 93–95; SI 51–55; FI 58–64. Head with almost parallel sides (Fig. 2A); posterior margin of head in full-face view emarginate medially; head in profile concave on vertex (Fig. 2B); anteroventral margin of cranium with a large median process. Clypeus without a median longitudinal carina. Eye situated at about 1/3 distance of head (from anterior margin of clypeus to posterior margin of occipital lobe). Frontal carina horizontally flanged, extending to 3/4 distance of head (Fig. 2A). Antennal scrobe deep and broadly covered by frontal carina. Antenna with 3-segmented club; terminal segment 1.1–1.2 times as long as preceding two segments together. Masticatory margin of mandible with apical and preapical teeth, and an inconspicuous denticle in front of basal angle. Promesonotum forming a dome, in profile only with a slight prominence on its posterior declivity (Fig. 2C); dorsal portion of the dome strongly and acutely produced laterally. Mesopleuron with a weak transverse impression. Propodeal spine long, blunt apically, 4 times as long as diameter of propodeal spiracle. Petiole ca. 1.9 times as long as postpetiole (excluding helcium); petiolar node in posterior view slightly emarginate at apex. Postpetiole ca. 2.0 times as broad as petiole, angulate laterally. Frons rugoso-reticulate, with enclosures punctured weakly and dull; dorsal and dorsolateral faces of occipital lobe reticulate, with enclosures smooth and shining; area between antennal scrobe and eye punctured and dull; ventrolateral face of occipital lobe smooth and shining; promesonotum weakly punctured and weakly shining, and with several transverse rugae dorsally; part of lateral face of promesonotum, lower part of mesopleuron, and declivitous face of propodeum smooth and shining; the remainder of alitrunk weakly punctured and ill shining; petiolar pedicel and lateral face of postpetiole very weakly punctured; the remainder of petiole and postpetiole, and gaster smooth and shining. Body brown.

*Minor* (paralectotypes). Measurements: HL 0.50–0.51 mm; HW 0.50–0.52 mm; SL 0.47–0.48 mm; AL 0.65 mm; FL 0.48–0.50 mm; CI 100–102; SI 92–94; FI 96–100. Head in full-face view slightly



**Fig. 2.** Lectotype and paralectotypes of *Pheidole aristotelis* Forel: A, major, head in Full-face view; B, same, head in profile; C, same, alitrunk in profile; D, minor, head in full-face view; E, same, alitrunk and waist in profile.

concave posteriorly (Fig. 2D); occipital carina absent dorsally on the head. Clypeus without a median longitudinal carina. Eye narrow, situated just in front of midlength of head. Frontal carina and antennal scrobe present only around antennal insertion. Antenna with 3-segmented club; in full-face view scape extending beyond posterior border of head by its  $1/6$  length; terminal segment 1.1–1.2 times as long as preceding two segments together. Promesonotum forming a low dome with a short protuberance on each shoulder, without a distinct prominence on its posterior declivity (Fig. 2E). Mesopleuron without any transverse impression. Propodeal spine horn-like, straight, 4 times as long as diameter of propodeal spiracle. Petiole 1.8–2.0 times as long as postpetiole (excluding helcium); petiolar node in posterior view not emarginate at apex. Postpetiole in dorsal view ca. 1.6 times as broad as petiole. Head and alitrunk punctured; petiolar pedicel very weakly punctured but shining; the remainder of petiole, and postpetiole and gaster smooth and shining.

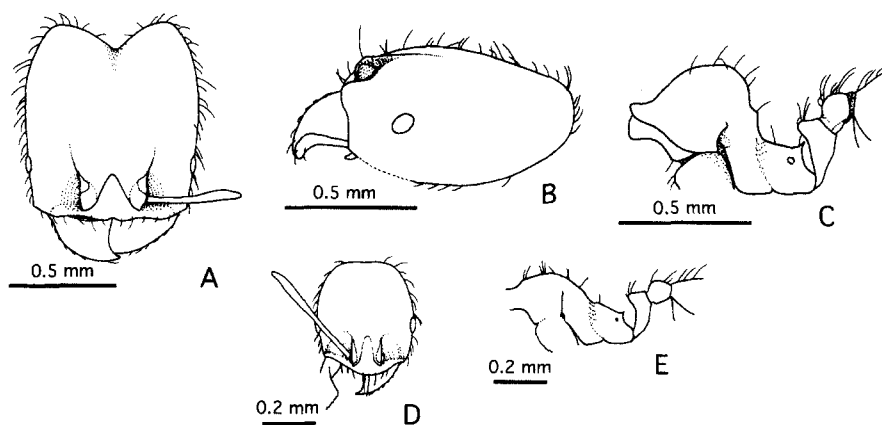
### ***Pheidole butteli* Forel**

(Fig. 3A–E)

*Pheidole butteli* Forel, 1913, Zool. Jahrb. Abt. Syst. Geogr. Biol. Tiere 36: 36, major, minor, queen and male; type locality: Tandjong Slam, Sumatra. Six syntypes (3 majors and 3 minors, MHN) were examined, of which one major is designated as the **lectotype**.

*Major* (lectotype and paralectotypes). Measurements: HL 0.91–0.92 mm; HW 0.80 mm; SL 0.43–0.44 mm; FL 0.57–0.58 mm; CI 87–88; SI 54–55; FI 71–73. Head broadest at about  $2/3$  distance of head (from anterior margin of clypeus to posterior margin of occipital lobe) (Fig. 3A); head in profile not impressed on vertex (Fig. 3B); anteroventral margin of cranium bearing 3 median processes. Eye situated just in front of  $1/3$  distance of head; distance between mandibular insertion and anterior margin of eye 1.5 times as long as maximal diameter of eye. Frontal carina and antennal scrobe only present around antennal insertion. Antenna with 3-segmented club; antennal scape slightly passing midlength of head; terminal segment ca. 1.2 times as long as preceding two segments together. Masticatory margin of mandible with apical and preapical teeth, and a distinct denticle in front of basal angle. Promesonotum forming a high dome, in profile with a slight prominence on its posterior declivity (Fig. 3C); dorsal portion of the dome weakly produced laterally. Propodeal spine triangular, 2–2.5 times as long as diameter of propodeal spiracle. Petiole ca. 1.6 times as long as postpetiole (excluding helcium); petiolar node in posterior view not emarginate at apex. Postpetiole ca. 1.7 times as broad as petiolar node, produced laterally. Dorsum of head excluding occipital lobe longitudinally rugose, with interspaces smooth and shining; dorsal and dorsolateral faces of occipital lobe reticulate, with very weakly punctured enclosures; lateral face of occipital lobe weakly rugoso-reticulate and dull; promesonotum excluding its lateral projections, largely smooth and shining; part of mesopleuron, and lateral faces of propodeum and petiolar pedicel weakly punctured; petiolar node, postpetiole and gaster smooth and shining.

*Minor* (paralectotypes). Measurements: HL 0.43 mm; HW 0.37–0.38 mm; SL 0.42 mm; AL 0.55–0.56 mm; FL 0.45 mm; CI 86–88; SI 111–114; FI 118. Head in full-face view almost straight posteriorly (Fig. 3D); occipital carina evanescent dorsally on the head. Eye narrow, situated just in front of midlength of head; distance between mandibular insertion and anterior margin of eye 0.7–0.8 times as



**Fig. 3.** Lectotype and paralectotypes of *Pheidole butteli* Forel: A, major, head in full-face view; B, same, head in profile; C, same, alitrunk and waist in profile; D, minor head in full-face view; E, same, alitrunk and waist in profile.

long as maximal diameter of eye. Antenna with 3-segmented club; in full-face view scape extending beyond posterior border of head by a little more than its 1/5 length; terminal segment ca. 1.2 times as long as preceding two segments together. Promesonotum in profile weakly convex dorsally, without any prominence on its posterior declivity (Fig. 3E). Mesopleuron without any transverse impression. Propodeal spine pointed apically, ca. 1.5–2 times as long as the diameter of propodeal spiracle. Petiole ca. 1.7 times as long as postpetiole (excluding helcium). Postpetiole in dorsal view subhexagonal, ca. 1.4 times as broad as petiolar node. Head and promesonotum smooth and shining; mesopleuron and part of lateral face of propodeum weakly punctured; petiolar pedicel weakly punctured laterally; the remainder of petiole, and postpetiole and gaster smooth and shining.

### ***Pheidole capellinii* Emery**

(Fig. 4A–E)

*Pheidole capellinii* Emery, 1887, Ann. Mus. Civ. Stor. Nat. (2) 5 [25]: 463 (footnote), major; type locality: Giava [Java]. One syntype (major, MCSN) was examined. (Fig. 4A–B)

*Pheidole lighti* Wheeler, 1927b, Amer. Mus. Nat. Hist. Novitates 255: 2, major and minor; type locality: Back Liang, China. Junior synonym of *P. capellinii*: Zhou & Zheng (1997). Five syntypes (1 major and 4 minors, MCZ: cotype–20661) were examined, of which the major is designated as the **lectotype** of *P. lighti*.

*Pheidole attila* Forel, 1913, Zool. Jahrb. Abt. Syst. Geogr. Biol. Tiere 36: 34, major and minor; type locality: Bahsoemboe, Sumatra. Six syntypes (3 majors and 3 minors, MHN) were examined, of which one major is designated as the **lectotype**. **Syn. nov.** (Fig. 4C–E)

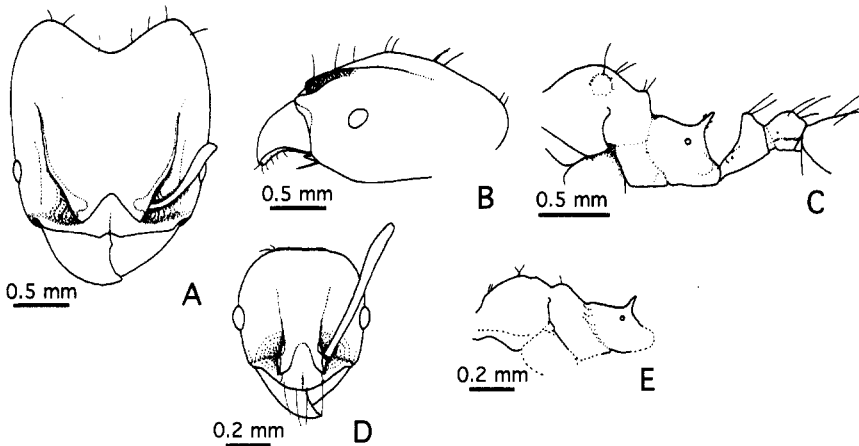
*Major* (syntype of *P. capellini*). Measurements: HL 1.90 mm; HW 1.78 mm; SL 0.84 mm; FL 1.36 mm; CI 94; SI 47; FI 76. Head broadest at 3/5 distance of head (from anterior margin of clypeus to

posterior margin of occipital lobe) (Fig. 4A); posterior margin of head in full-face view strongly emarginate; in profile dorsal outline of head with a median peak and anterior and posterior slopes that are almost straight (Fig. 4B); anteroventral margin of cranium with three low median processes. Clypeus with a median longitudinal carina. Eye situated at about 1/3 distance of head. Frontal carina flanged, running about 2/3 distance of head. Antennal scrobe present as a shallow excavation under frontal carina. Antenna with 3-segmented club; scape extending to midlength of head; terminal segment ca. 0.8–0.9 times as long as preceding two segments together. Masticatory margin of mandible with apical and preapical teeth, and a denticle in front of basal angle. Promesonotum in profile (Fig. 4C) forming a dome, with a distinct prominence on its posterior declivity; dorsal portion of the dome produced laterally. Propodeal spine horn-like, straight, blunt apically, ca. 4.5 times as long as diameter of propodeal spiracle. Petiole in profile cuneiform, ca. 1.6 times as long as postpetiole (excluding helcium); petiolar node in posterior view not emarginate at apex. Postpetiole ca. 1.8 times as broad as petiolar node, in dorsal view angulate laterally. Frons longitudinally rugose, with interspaces punctured and dull; anterolateral face of head punctured with several longitudinal rugae; dorsolateral face of occipital lobe largely smooth and shining; promesonotum weakly punctured and weakly shining, with weak transeverse rugae; the remainder of alitrunk, and petiole and postpetiole punctured and dull; gaster smooth and shining. Head bearing a few erect hairs dorsally, in full-face view 7 erect hairs on posterior margin of head (Fig. 4A); alitrunk bearing only several pairs of erect hairs (Fig. 4C); petiole and postpetiole bearing one and three pairs of erect hairs respectively; gaster scattered with erect hairs; body scattered with short appressed hairs.

*Minor* (paralectotypes of *P. attila*). Measurements: HL 0.64–0.65 mm; HW 0.58 mm; SL 0.64–0.65 mm; AL 0.84–0.86 mm; FL 0.71 mm; CI 89–91; SI 110–112; FI 122. Head in full-face view elliptical (Fig. 4D); occipital carina present but not strongly flanged. Eyes situated at midlength of head. Frontal carina inconspicuous, extending beyond the midlength of head. Antennal scrobe present only around antennal insertion. Antenna with 3-segmented club; in full-face view scape extending beyond posterior border of head by its 1/4 length; terminal segment 0.8–0.9 times as long as preceding two segments together. Promesonotum forming a dome, with a distinct prominence on its posterior declivity (Fig. 4E). Mesopleuron without any transverse impression. Propodeal spine elongate-triangular, ca. 3.5 times as long as diameter of propodeal spiracle. Petiole ca. 1.5 times as long as postpetiole (excluding helcium); petiolar node distinct, in posterior view emarginate at apex. Postpetiole in dorsal view subpentagonal, twice as broad as petiolar node. Head and alitrunk punctured and dull (punctuation on head and promesonotum weaker than that on mesopleuron and propodeum); petiole and postpetiole weakly punctured; gaster smooth and shining. Head bearing at most 10 pairs of erect hairs dorsally; alitrunk bearing at most 5 pairs of erect hairs on promesonotal dorsum (Fig. 4E); dorsa of petiole and postpetiole bearing 1 or 2 pairs of suberect hairs respectively; gaster scattered with erect hairs; body scattered with short appressed hairs.

*Remarks.* The lectotype and two paralectotypes (major) of *P. attila* Forel agree well with the syntype of *P. capellini* Emery. Thus, I propose the former as a junior synonym of the latter. According to my examination of the type materials of *P. capellini* with the Chinese *P. lighti* Wheeler, I also agree with the view of Zhou & Zheng (1997) that these are conspecific.





**Fig. 4.** Syntype of *Pheidole capellinii* Emery and lectotype and paralectotype of *P. attila* Forel: A, major, head in full-face view; B, same, head in profile; C, same (*P. attila*), alitrunk and waist in profile; D, minor (*P. attila*), head in full-face view; E, same, alitrunk in profile.

#### ***Pheidole comata* Fr. Smith**

*Pheidole comata* Fr. Smith, 1858, Cat. Hym. Ins. Coll. Brit. Mus. 6: 176, major; type locality: Sarawak, Borneo. One syntype (major, BMNH) was examined.

*Pheidole multicoma* Eguchi, 1999, Jpn. J. Syst. Ent. 5: 100, major and minor. The holotype (major, UMS) was examined. **Syn. nov.**

*Remarks.* The holotype of *P. multicoma* Eguchi agrees well with the syntype of *P. comata* (excepting body color darker than that of the latter). Thus, I proposed *P. multicoma* to a junior synonym of *P. comata*.

#### ***Pheidole elisae* Emery**

*Pheidole elisae* Emery, 1900, Ann. Mus. Civ. Stor. Nat. (2) 20 [40]: 686–687, major; type locality: Bua–Bua, Engano. One syntype (major, MCSN) was examined.

*Remarks.* See under *P. sarawakana* Forel.

#### ***Pheidole elisae nenia* Forel**

*Pheidole elisae* var. *nenia* Forel, 1913, Zool. Jahrb. Abt. Syst. Geogr. Biol. Tiere 36: 30, major and minor; type locality: Bandar Baroe (3500 feet), C. Sumatra. Revised status as subspecies: Bolton, 1995b. Six syntypes (3 majors and 3 minors, MHN) were examined, of which one major is designated as the **lectotype**.

*Remarks.* See under *P. sarawakana* Forel.

***Pheidole exasperata* (Mayr)**

*Ischnomyrmex exasperatus* Mayr, 1866, Sitzungsber. Kais. Akad. Wiss. Wien Math.-Naturwiss. Cl. Abt.

I 53: 506, minor. Type locality is not indicated on its labels, as noted in Mayr, 1866. One syntype (minor, NHMW) was examined, and is designated as the **lectotype**.

*Pheidole exasperata*: Viehmeyer, 1914, Zool. Jahrb. Syst. 37: 606.

*Remarks.* See under *P. aglae*.

***Pheidole gatesi* (Wheeler)**

*Aphaenogaster (Attomyrma) gatesi* Wheeler, 1927a, Psyche 34: 44, minor; type locality: Rangoon, Burma. Two syntypes (minors, MCZ: cotype-20600) were examined, of which one minor is designated as the **lectotype**.

*Pheidole gatesi*: Brown, 1967, Psyche 73: 283.

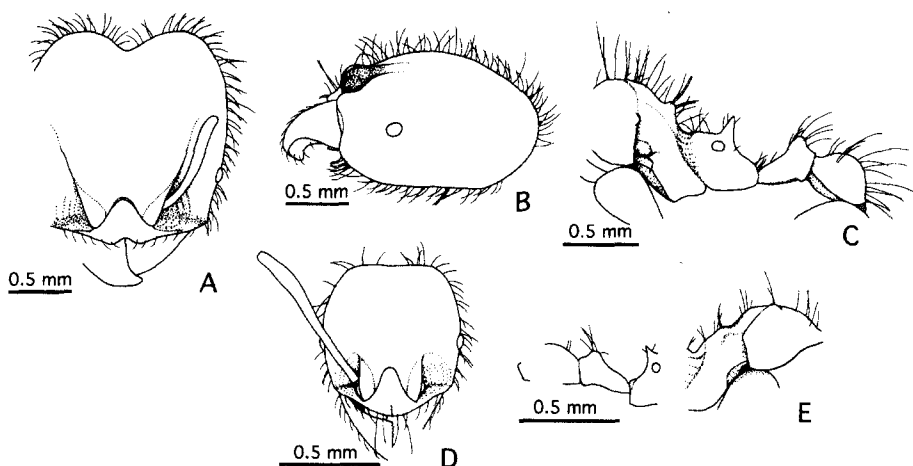
*Remarks.* Based on my comparison of the syntypes of this species with 10 of *P. smythiesii* Forel (MHN) and one of *P. s. bengalensis* Forel (MNH), I completely agree with Brown (1967) suggesting that this species is closely related to *Pheidole smythiesi* but different from the latter at the specific level. Furthermore it is also different specifically from *P. bluntschlii* Forel (3 syntype minors (MHN) were examined) in details of head and alitrunk structure of the minor.

***Pheidole ghigii* Emery**

(Fig. 5A-E)

*Pheidole ghigii* Emery, 1900, Ann. Mus. Civ. Stor. Nat. (2) 20 [40]: 685, major and minor; type locality: Si-Rambé, Sumatra. Two syntypes (1 major and 1 minor, MCSN) were examined.

*Major* (syntype). Measurements: HL 1.71 mm; SL 0.88 mm; FL 1.27 mm. Head broadest at about 2/3 distance of head (from anterior margin of clypeus to posterior margin of occipital lobe) (Fig. 5A); posterior margin of head in full-face view broadly emarginate; head in profile not concave on vertex (Fig. 5B); anteroventral margin of cranium with a pair of median processes. Clypeus without a median longitudinal carina. Eye small, situated at about 1/3 distance of head; distance between mandibular insertion and anterior margin of eye ca. 2.5 times as long as maximal diameter of eye. Frontal carina weak, running about 2/3 distance of head. Antennal scrobe present only around antennal insertion. Antenna with 3-segmented club; scape slightly extending beyond 2/3 distance of head; terminal segment almost as long as preceding two segments together. Masticatory margin of mandible with apical and preapical teeth, and a denticle in front of basal angle. Promesonotum in profile (Fig. 5C) forming a dome, with a distinct prominence on its posterior declivity. Mesopleuron without transverse impression. Propodeal spine stout, ca. 3 times as long as diameter of propodeal spiracle. Petiole in profile cuneiform, almost as long as postpetiole (excluding helcium); petiolar node in posterior view slightly emarginate at apex. Postpetiole in dorsal view subpentagonal, ca. 2.3 times as broad as petiolar node. Frons longitudinally rugose; vertex to occipital lobe rugoso-reticulate; anterolateral face of head reticulate; alitrunk irregularly rugoso-reticulate,



**Fig. 5.** Syntypes of *Pheidole ghigii* Emery: A, major, head in full-face view; B, same, head in profile; C, same, alitrunk and waist in profile; D, minor, head in full-face view; E, same, alitrunk and waist in profile.

with enclosures smooth and shining; petiole, postpetiole and anterior part of first gastral tergite weakly punctured and dull.

*Minor* (syntype). Measurements: HL 0.78 mm; HW 0.69 mm; SL 0.82 mm; AL 0.98 mm; FL 0.86 mm; CI 88; SI 119; FI 124. Head in full-face view elliptical (Fig. 5D); occipital carina distinct. Clypeus with a weak median longitudinal carina. Eyes small, situated just in front of midlength of head; distance between madibular insertion and anterior margin of eye ca. 1.9 times as long as maximal diameter of eye. Frontal carina and antennal scrobe present only around antennal insertion. Antenna with 3-segmented club; in full-face view scape extending beyond posterior border of head by more than its 1/4 length; terminal segment almost as long as preceding two segments together. Promesonotum forming a dome, with a low protuberance on each shoulder (Fig. 5E), with a prominence on its posterior declivity. Mesopleuron without any transverse impression. Propodeal spine elongate-triangular, 2.5 times as long as diameter of propodeal spiracle. Petiole in profile cuneiform, ca. 0.9 times as long as postpetiole (excluding helcium); petiolar node low, in posterior view not emarginate at apex. Postpetiole ca. 2.2 times as broad as petiolar node. Head and promesonotum very weakly punctured; mesopleuron and propodeum weakly punctured; petiolar pedicel weakly punctured; the remainder of petiole, and postpetiole and gaster smooth and shining.

### ***Pheidole havilandi* Forel**

*Pheidole havilandi* Forel, 1911a, Rev. Suisse Zool. 19: 38, major, minor, queen and male; type locality: Sarawak, Borneo. Nine syntypes (2 majors, 3 minors, 1 queen and 3 males, MHN) were examined.

*Pheidole havilandi* var. *sapuana* Forel, 1911c, Bull. Soc. Vaudoise Sci. Nat. 47: 373, major and minor; type locality: C. Sumatra. Revised status as subspecies: Bolton, 1995b. Five syntypes (4 majors and 1 minor, MHN) were examined, of which one major is designated as the **lectotype**. **Syn. nov.**

*Pheidole havilandi* var. *selangorensis* Forel, 1913, Zool. Jahrb. Abt. Syst. Geogr. Biol. Tiere 36: 31,

major, minor, queen and male; type locality: Selangor, Malacca. Revised status as subspecies: Bolton, 1995b. Nine syntypes (3 majors, 3 minors, 1 queen and 2 males, MHN) were examined, of which one major is designated as the **lectotype. Syn. nov.**

*Remarks.* “*P. havilandi sapuana*” and “*P. h. selangorensis*” should be considered to be local populations of *P. havilandi*.

### ***Pheidole huberi* Forel**

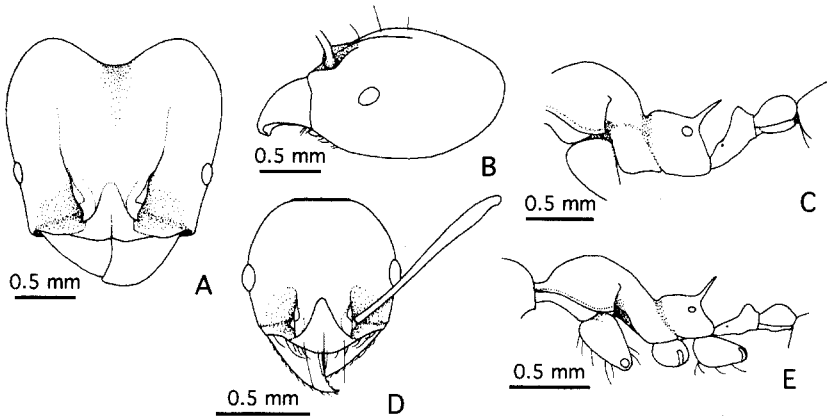
(Fig. 6A–E)

*Pheidole huberi* Forel, 1911c, Bull. Soc. Vaudoise Sci. Nat. 47: 374, major and minor; type locality: C. Sumatra. Three syntypes (1 major and 2 minors, MHN) were examined, of which the major is designated as the **lectotype.**

*Pheidole huberi* var. *perakensis* Forel, 1911c, Bull. Soc. Vaudoise Sci. Nat. 47: 376 and 386, major, minor and queen; type locality: Perak, W. Malaysia. Revised status as subspecies: Bolton, 1995b. Seven syntypes (3 majors, 3 minors and 1 queen, MHN) were examined, of which one major is designated as the **lectotype. Syn. nov.** (Fig. 6A–E)

*Major* (type materials of *P. huberi* and *P. h. perakensis*). Measurements (lectotype of *P. huberi*): HL 1.65 mm; HW 1.77 mm; SL 0.99 mm; FL 1.49 mm; CI 107; SI 56; FI 95. Head broadest at 4/5 distance of head (from anterior margin of clypeus to posterior margin of occipital lobe) (Fig. 6A); posterior margin of head in full-face view broadly emarginate; head in profile not concave on vertex (Fig. 6B); anteroventral margin of cranium with three median processes (median one smallest). Clypeus with a median longitudinal carina. Eye situated at about 1/3 distance of head. Frontal carina weak, extending to about 2/3 distance of head. Antennal scrobe present only around antennal insertion. Antenna with 3-segmented club; scape reaching about 2/3 distance of head; terminal segment ca. 0.8–0.9 times as long as preceding two segments together. Masticatory margin of mandible with apical and preapical teeth, and a denticle in front of basal angle. Promesonotum in profile (Fig. 6C) forming a dome, without a distinct prominence on its posterior declivity; dorsal portion of the dome not distinctly produced laterally. Mesopleuron with an inconspicuous transverse impression. Propodeal spine horn-like, narrowly based, ca. 5 times as long as diameter of propodeal spiracle (Fig. 6C). Petiole in profile cuneiform, ca. 1.3 times as long as postpetiole (excluding helcium); petiolar node in posterior view not emarginate at apex. Postpetiole ca. 2.0 times as broad as petiolar node. Frons longitudinally rugose, with interspaces smooth and shining; the longitudinal rugae curved outward on occipital lobes; anterolateral face of head rugoso-reticulate, with weakly punctured enclosures; dorsum of promesonotum with arched rugulae; lateral face of promesonotum largely smooth and shining; mesopleuron and lateral face of propodeum rugoso-reticulate, with weakly punctured enclosures; dorsa of petiole and postpetiole smooth and shining; lateral face of them punctured weakly and dull. Body with few erect hairs (Fig. 6A–C), but scattering short appressed hairs being everywhere.

*Minor* (type materials of *P. huberi* and *P. h. perakensis*). Measurements (paralectotypes of *P. huberi*): HL 0.83–0.88 mm; HW 0.75–0.77 mm; SL 0.97–1.00 mm; AL 1.22–1.28 mm; FL 1.25–1.30 mm; CI 88–90; SI 129–130; FI 167–169. Head in full-face view elliptical (Fig. 6D); occipital carina distinct.



**Fig. 6.** Lectotype and paralectotypes of *Pheidole huberi* var. *perakensis* Forel: A, major, head in full-face view; B, same, head in profile; C, same, alitrunk and waist in profile; D, minor, head in full-face view; E, same, alitrunk and waist in profile.

Clypeus with a median longitudinal carina. Eyes situated at about midlength of head. Frontal carina and antennal scrobe present only around antennal insertion. Antenna with 3-segmented club; in full-face view scape extending beyond posterior border of head by its 1/3 length; terminal segment 0.8–0.9 times as long as preceding two segments together. Promesonotum forming a dome, without a prominence on its posterior declivity (Fig. 6E). Mesopleuron without any transverse impression. Propodeal spine horn-like, ca. 5 times as long as diameter of propodeal spiracle. Petiole in profile elongate cuneiform, ca. 1.4 times as long as postpetiole (excluding helcium); petiolar node low, in posterior view not emarginate at apex. Postpetiole 1.8–2.0 as broad as petiolar node. Head largely smooth and shining, and area between antennal insertion and eye weakly punctured; promesonotum smooth and shining; mesopleuron and propodeum punctured; petiolar pedicel very weakly punctured; the remainder of petiole, and postpetiole and gaster smooth and shining. Body with few erect hairs (Fig. 6D and E), but scattering short appressed hairs being everywhere.

*Remarks.* Although rugae on head and promesonotum of the major of *P. huberi perakensis* Forel is weaker, but the form should be considered to be a geographical race of *P. huberi*.

### ***Pheidole inscrobiculata* Viehmeyer**

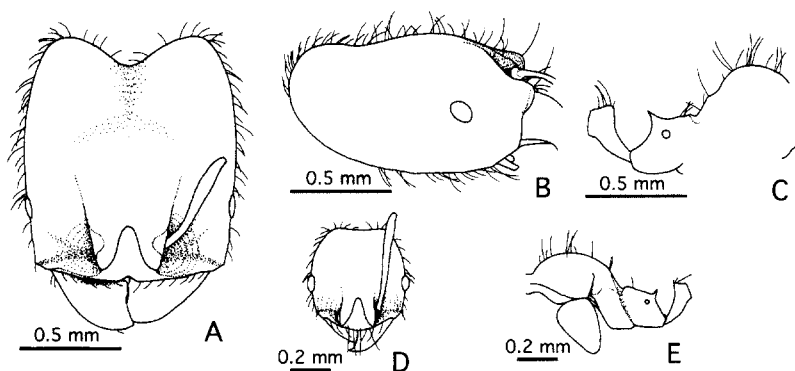
(Fig. 7A–E)

*Pheidole inscrobiculatus* Viehmeyer, 1916a, Arch. Naturgesch. 81: 120, major and minor; type locality: Gunong Angsi, Malacca. Two syntypes (1 major and 1 minor, MNHU) were examined, of which the major is designated as the **lectotype**.

*Major* (lectotype). Measurements: TL 2.9 mm; HL 1.22 mm; HW 1.02 mm; SL 0.51 mm; FL 0.73 mm; CI 84; SI 50; FI 72. Head broadest at about midlength of head (Fig. 7A), in profile slightly impressed on vertex (Fig. 7B); anteroventral margin of cranium bearing 3 median processes (median one smallest).

Clypeus without a median longitudinal carina. Eye situated at about  $1/3$  distance of head (from anterior margin of clypeus to posterior margin of occipital lobe). Frontal carina and antennal scrobe only present around antennal insertion. Antenna with a 3-segmented club; scape reaching about midlength of head; terminal segment 1.3 times as long as preceding two segments together. Masticatory margin of mandible with apical and preapical teeth, and a distinct denticle in front of basal angle. Promesonotum forming a high dome, in profile (Fig. 7C) with a slight prominence on its posterior declivity; dorsal portion of the dome weakly produced laterally. Mesopleuron without a transverse impression. Propodeal spine triangular, ca. 2.5 times as long as diameter of propodeal spiracle. Petiole ca. 2 times as long as postpetiole (excluding helcium); petiolar node in posterior view hardly emarginate at apex. Postpetiole ca. 1.8 times as broad as petiolar node. Frons longitudinally rugose; dorsal and dorsolateral faces of occipital lobe reticulate, with very weakly punctured enclosures; dorsum of promesonotal dome very weakly punctured with several weak rugae; lateral face of the dome largely smooth and shining; the remainder of alitrunk, and waist and first gastral tergite weakly punctured.

*Minor* (paralectotype). Measurements: TL 1.6 mm; HL 0.52 mm; HW 0.48 mm; SL 0.50 mm; AL 0.74 mm; FL 0.57 mm; CI 91; SI 105; FI 119. Head in full-face view slightly concave posteriorly (Fig. 7D); occipital carina weak. Clypeus without a median longitudinal carina. Eye situated just in front of midlength of head. Frontal carina and antennal scrobe present only around antennal insertion. Antenna with 3-segmented club; in full-face view scape extending beyond posterior border of head by a little more than its  $1/6$  length; terminal segment ca. 1.1 times as long as preceding two segments together. Promesonotum in profile convex, without any prominence on its posterior declivity (Fig. 7E). Mesopleuron without a distinct transverse impression. Propodeal spine ca. 2.5 times as long as diameter of propodeal spiracle. Petiole 1.7 times as long as postpetiole (excluding helcium). Postpetiole in dorsal view subhexagonal, 1.6 times as broad as petiolar node. Head and promesonotum smooth and shining; the remainder of alitrunk weakly punctured at least partly; petiolar pedicel weakly punctured laterally; the remainder of petiole, and postpetiole and gaster smooth and shining.



**Fig. 7.** Lectotype and paralectotype of *Pheidole inscrobiculatus* Viehmeyer: A, major, head in full-face; B, same, head in profile; C, same, alitrunk and waist in profile; D, minor, head in full-face view; E, same, alitrunk and waist in profile.

***Pheidole magretti* Emery**

*Pheidole magretti* Emery, 1887, Ann. Mus. Civ. Stor. Nat. (2) 5 [25]: 462, major and minor; type locality: Cibodas, Java. Two syntypes (major, MCSN) were examined.

*Pheidole nodgii* r. *maxwellensis* Forel, 1913, Zool. Jahrb. Abt. Syst. Geogr. Biol. Tiere 36: 40, major and minor; type locality: Maxwell's Hill, Malacca. Revised status as subspecies: Bolton, 1995b. Five syntypes (2 majors and 3 minors, MHN) were examined, of which one major is designated as the **lectotype**. **Syn. nov.**

**Remarks.** The lectotype of *P. nodgii* r. *maxwellensis* agrees well with a major from colony FI91-30 (Mt. Gede, W. Java, F. Ito leg., 1990) which was previously compared with the type series (2 majors) of *P. magretti*. The only difference between the type of *P. nodgii* r. *maxwellensis* and the major from FI91-30 is that in profile head not concave on vertex in the former, but gently concave in the latter. Thus, I synonymize *P. nodgii* r. *maxwellensis* with *P. magretti* Emery.

*P. magretti* is doubtless closely related to *P. nodgii* Forel and "*P. n.* var. *tjibodana* Forel" (see below). The differences between the examined specimens of *P. magretti* and the type series of the two "forms" of *P. nodgii* are as follows: lateral surface of occipital lobe of the major largely smooth and shining in the former, while reticulate, with enclosures punctured and dull in the latter; propodeal spine 2.5 times as long as the diameter of propodeal spiracle in the major and 1.5 times in the minor in the former, while more than 3.5 times in both the subcastes in the latter. Both *P. magretti* and the two "forms" are almost sympatric in Java, suggesting that they are actually biological species.

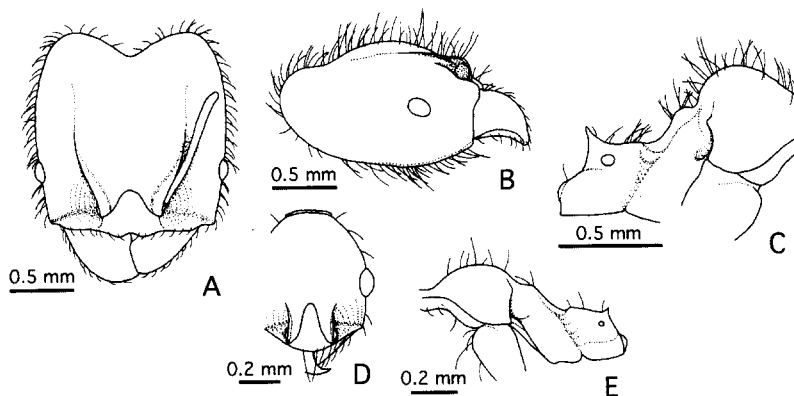
***Pheidole makilingi* Viehmeyer**

(Fig. 8A-E)

*Pheidole makilingi* Viehmeyer, 1916b, Entomol. Mitt. 5: 285, major and minor; type locality: Luzon.

Two syntypes (1 major and 1 minor, MNHU) were examined, of which the major is designated as the **lectotype**. The specimens are labeled as "*Pheidole makingi*", although they are doubtless *P. makilingi*, because their locality and collector (Luzon, Baker) agree with those mentioned in the original description of *P. makilingi*.

**Major (lectotype).** Measurements: TL 3.4 mm; HL 1.60 mm; HW 1.47 mm; SL 0.93 mm; FL 1.30 mm; CI 92; SI 63; FI 88. Head broadest at about 2/3 distance of head (from anterior margin of clypeus to posterior margin of occipital lobe) (Fig. 8A); posterior margin of head in full-face view strongly emarginate; head in profile slightly concave on vertex (Fig. 8B); anteroventral margin of cranium almost straight, with three indistinct median processes. Clypeus without a median longitudinal carina. Eye situated at about 1/3 distance of head. Frontal carina distinct, extending to almost 2/3 distance of head. Antennal scrobe inconspicuous, running below the frontal carina. Antenna with 3-segmented club; scape extending to about 2/3 distance of head; terminal segment ca. 0.8 times as long as preceding two segments together. Masticatory margin of mandible with apical and preapical teeth, and a denticle in front of basal angle. Promesonotum in profile (Fig. 8C) forming a dome, with a distinct prominence on its posterior declivity. Mesopleuron without a distinct transverse impression. Propodeal spine ca. 2.5 times



**Fig. 8.** Lectotype and paralectotype of *Pheidole makilingi* Viehmeyer: A, major, head in full-face view; B, same, head in profile; C, same, alitrunk in profile; D, minor, head in full-face view; E, same, alitrunk in profile.

as long as diameter of propodeal spiracle. Petiole in profile cuneiform, ca. 1.4 times as long as postpetiole (excluding helcium); petiolar node in posterior view slightly emarginate at apex. Postpetiole in dorsal view subpentagonal, ca. 2.0 times as broad as petiolar node. Frons longitudinally rugose; vertex, and dorsal and lateral faces of occipital lobe rugoso-reticulate; promesonotum transversely rugose, with smooth and shining interspaces; mesopleuron and lateral faces of propodeum very weakly punctured but shining, and with several rugae; petiolar node smooth and shining; the remainder of petiole, and postpetiole and anterior part of first gastral tergite weakly punctured.

*Minor* (paralectotype). Head in full-face view elliptical (Fig. 8D); occipital carina well developed. Clypeus without a median longitudinal carina. Eyes situated just in front of midlength of head. Frontal carina and antennal scrobe present only around antennal insertion. Antenna with 3-segmented club; in full-face view scape extending beyond posterior border of head by more than its 1/3 length; terminal segment 0.8 times as long as preceding two segments together. Promesonotum forming a dome, with a gentle prominence on its posterior declivity (Fig. 8E). Mesopleuron without a transverse impression. Propodeal spine elongate-triangular, ca. 1.5 times as long as diameter of propodeal spiracle. Petiole in profile cuneiform, ca. 1.2 times as long as postpetiole (excluding helcium); petiolar node low, in posterior view not emarginate at apex. Postpetiole in dorsal view subpentagonal, ca. 1.9 times as broad as petiolar node. Head and promesonotum smooth and shining; mesopleuron and lateral face of propodeum punctured slightly but shining; petiole, postpetiole and gaster almost smooth and shining.

### ***Pheidole modiglianii* Emery**

(Fig. 9A-E)

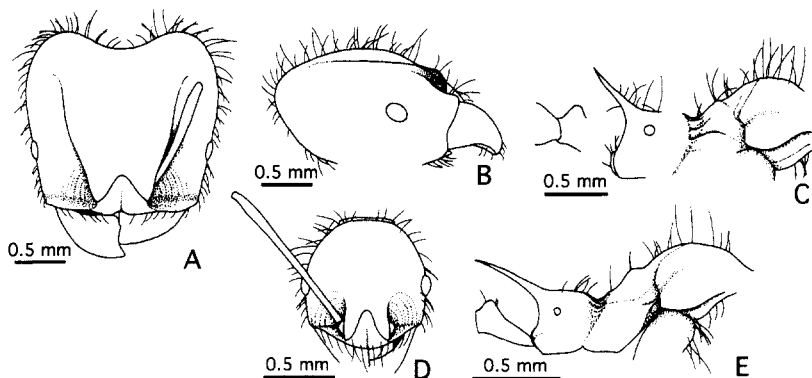
*Pheidole modiglianii* Emery, 1900, Ann. Mus. Civ. Stor. Nat. (2) 20 [40]: 684, major, minor and queen; type locality: Sereinu, Sipora, Mentawai. Two syntypes (1 major and 1 minor, MCSN) were examined.

*Major* (syntype). Measurements: HL 1.89 mm; HW 1.90 mm; SL 1.13 mm; FL 1.79 mm; CI 101; SI



59; FI 94. Head broadest at about  $2/3$  distance of head (from anterior margin of clypeus to posterior margin of occipital lobe) (Fig. 9A); posterior margin of head broadly emarginate; head in profile not concave on vertex (Fig. 9B). Clypeus with a median longitudinal carina. Eye situated at about  $1/3$  distance of head. Frontal carina weakly extending to about  $3/4$  distance of head. Antennal scrobe present only around antennal insertion. Antenna with 3-segmented club; scape reaching about  $3/4$  distance of head; terminal segment ca. 0.8 times as long as preceding two segments together. Masticatory margin of mandible with apical and preapical teeth, and an indistinct denticle in front of basal angle. Promesonotum in profile forming a dome, with a low prominence on its posterior declivity (Fig. 9C); dorsal portion of the dome slightly produced laterally. Mesopleuron without a distinct transverse impression. Propodeal spine exceptionally long, almost as long as petiole (Fig. 9C). Petiole in profile cuneiform, ca. 1.4 times as long as postpetiole (excluding helcium); petiolar node in posterior view slightly emarginate at apex. Postpetiole ca. 1.6 times as broad as petiolar node. Frons longitudinally rugose, with smooth and shining interspaces; the longitudinal rugae curved outward on occipital lobes; anterolateral face of head rugoso-reticulate; dorsum of promesonotum smooth and shining with several transverse rugae; mesopleuron and lateral face of propodeum rugoso-reticulate, with enclosures very weakly punctured but shining; petiolar pedicel and lateral face of postpetiole punctured and dull; the remainder of petiole and postpetiole, and gaster smooth and shining. Body with scattering erect hairs.

*Minor* (syntype). Measurements: HL 0.93 mm; HW 0.83 mm; SL 1.16 mm; AL 1.42 mm; FL 1.45 mm; CI 89; SI 140; FI 175. Head in full-face view elliptical; occipital carina distinctly flanged (Fig. 9D). Clypeus with a median longitudinal carina. Eyes situated at about midlength of head. Frontal carina and antennal scrobe present only around antennal insertion. Antenna with 3-segmented club; in full-face view scape extending beyond posterior border of head by its  $1/3$  length; terminal segment ca. 0.8 times as long as preceding two segments together. Promesonotum forming a dome, with a low prominence on its posterior declivity (Fig. 9E). Mesopleuron without a transverse impression. Propodeal spine exceptionally long, passing posterior margin of petiole (Fig. 9E). Petiole in profile elongate cuneiform, ca. 1.4 times as long as postpetiole (excluding helcium); petiolar node low, in posterior view not emarginate



**Fig. 9.** Syntypes of *Pheidole modiglianii* Emery: A, major, head in full-face view; B, same, head in profile; C, same, alitrunk and waist in profile; D, minor, head in full-face view; E, same, alitrunk and waist in profile.

at apex. Postpetiole ca. 1.7 as broad as petiolar node. Head largely smooth and shining; area between antennal insertion and eye weakly punctured and with several rugae; promesonotum concentrically rugose dorsally, and interspaces very weakly punctured but shining; mesopleuron and propodeum rugoso-reticulate, with weakly punctured enclosures; petiolar pedicel very weakly punctured; the remainder of petiole, and postpetiole and gaster smooth and shining. Body with scattering erect hairs.

### ***Pheidole noda* Fr. Smith**

*Pheidole nodus* Fr. Smith, 1874, Trans. Entomol. Soc. Lond. (4) 7: 407, major; type locality: Japan. Japanese specimens treated as *P. noda* in Terayama (1999) were examined, but the syntypes have not been examined yet.

*Pheidole treubi* Forel, 1905, Jahrb. Hambg. Wiss. Anst. 22: 19, major and queen; type locality: Bogor, Java. One syntype (major, MHN) was examined, and is designated as the **lectotype**. **Syn. nov.**

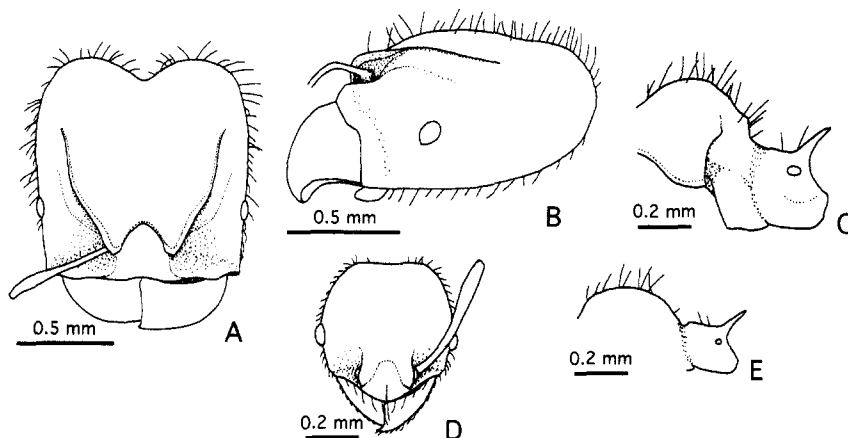
*Remarks.* The lectotype of *P. treubi* agrees well with Japanese specimens treated as *P. noda* in Terayama (1999), and thus *P. treubi* should be an isolated population of *P. noda*. This is probably the first record of this species from the Malay Archipelago.

### ***Pheidole nodgii* Forel**

(Fig. 10A–E)

*Pheidole nodgii* Forel, 1905, Jahrb. Hambg. Wiss. Anst. 22: 16, major, minor and queen; type locality: Java. Three syntypes (1 major, 1 minor and 1 queen, MHN) were examined, of which the major is designated as the **lectotype**.

*Major* (lectotype). Measurements: HL 1.18 mm; HW 1.10 mm; SL 0.59 mm; FL 0.68 mm; CI 93; SI 54; FI 62. Head with almost parallel sides (Fig. 10A); posterior margin of head in full-face view concave medially; head in profile slightly concave on vertex (Fig. 10B); anteroventral margin of cranium with a large median process. Clypeus without a median longitudinal carina. Eye situated at about 1/3 distance of head (from anterior margin of clypeus to posterior margin of occipital lobe). Frontal carina horizontally flanged, extending to 2/3 distance of head (Fig. 10A). Antennal scrobe deeply excavated under frontal carina. Antenna with 3-segmented club; terminal segment ca. 1.3 times as long as preceding two segments together. Masticatory margin of mandible with apical and preapical teeth, and an indistinct denticle in front of basal angle. Promesonotum forming a dome, only with a slight prominence on its posterior declivity (Fig. 10C); dorsal portion of the dome produced laterally. Mesopleuron without a transverse impression. Propodeal spine horn-like, slightly curved apically, 4 times as long as diameter of propodeal spiracle. Petiolar node apically blunt in profile, and slightly emarginate medially in posterior view. Postpetiole and gaster missing. Frons longitudinally rugose, and interspaces almost smooth and shining; dorsal and dorsolateral faces of occipital lobe, and area between antennal scrobe and eye reticulate, with enclosures weakly punctured and dull; lateral and ventrolateral faces of occipital lobe punctured and dull; antennal scrobe punctured and dull; promesonotum weakly reticulate dorsally, with enclosures punctured and dull; lower part of mesopleuron partly smooth and shining; the remainder of



**Fig. 10.** Lectotype and paralectotype of *Pheidole nodgii* Forel: A, major, head in full-face view; B, same, head in profile; C, same, alitrunk in profile; D, minor, head in profile; E, same, alitrunk in profile.

alitrunk punctured and dull; anterodorsal face of petiole smooth and shining; the remainder of petiole weakly punctured and less shining.

*Minor* (paralectotype). Measurements: HL 0.54 mm; HW 0.50 mm; SL 0.50 mm; AL 0.68 mm; FL 0.55 mm; CI 93; SI 100; FI 110. Head in full-face view slightly concave posteriorly (Fig. 10D); occipital carina evanescent dorsally on the head. Clypeus with a weak median longitudinal carina. Eyes narrow, situated just in front of the midlength of head. Frontal carina and antennal scrobe present only around antennal insertion. Antenna with 3-segmented club; in full-face view scape slightly extending beyond posterior border of head by its 1/6 length; terminal segment ca. 1.2 times as long as preceding two segments together. Promesonotum forming a dome, without a distinct prominence on its posterior declivity (Fig. 10E); dorsal portion of the dome slightly produced laterally. Mesopleuron without any transverse impression. Propodeal spine horn-like, straight, 4 times as long as diameter of propodeal spiracle. Petiole 1.3 times as long as postpetiole (excluding helcium); petiolar node distinct, in posterior view not emarginate at apex. Postpetiole in dorsal view subhexagonal, 1.8 times as broad as petiole. Head and alitrunk punctured; petiolar pedicel very weakly punctured but shining; the remainder of petiole, and postpetiole and gaster smooth and shining.

*Remarks.* See also under *P. magretti* and *P. tjibodana*.

### ***Pheidole plinii* Forel**

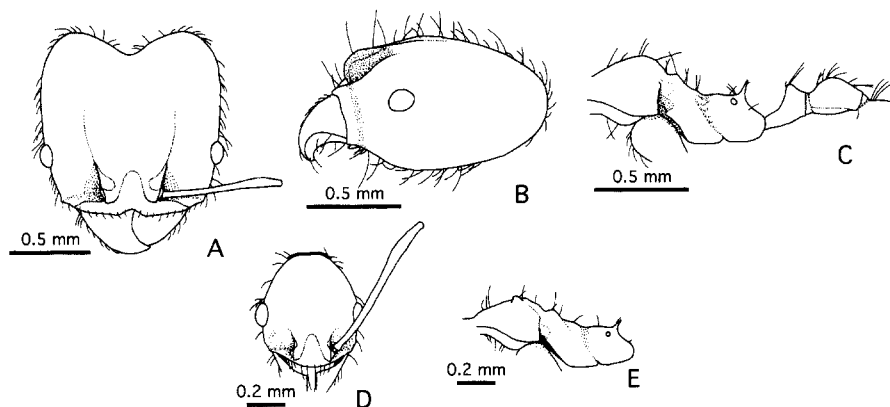
(Fig. 11A–E)

*Pheidole plinii* Forel, 1911a. Rev. Suisse Zool. 19: 40, major, minor and queen; type locality: Singapore. Seven syntypes (3 majors, 3 minors and 1 queen, MHN) were examined, of which one major is designated as the **lectotype**.

*Major* (lectotype and paralectotypes). Measurements: HL 1.18–1.19 mm; HW 1.09–1.13 mm; SL 0.73–0.76 mm; FL 0.92–0.94 mm; CI 92–96; SI 67; FI 81–85. Head broadest at 1/2–2/3 distance of

head (from anterior margin of clypeus to posterior margin of occipital lobe) (Fig. 11A); posterior margin of head broadly emarginate; head in profile not concave on vertex (Fig. 11B); anteroventral margin of cranium with a pair of median processes. Clypeus without a median longitudinal carina. Eye situated at about 1/3 distance of head. Frontal carina weak, extending to about 3/5 distance of head. Antennal scrobe present only around antennal insertion. Antenna with 3-segmented club; scape slightly extending beyond 2/3 distance of head; terminal segment ca. 0.8–0.9 times as long as preceding two segments together. Masticatory margin of mandible with apical and preapical teeth, and a denticle in front of basal angle. Promesonotum forming a dome, with a distinct prominence on its posterior declivity (Fig. 12C). Mesopleuron without a transverse impression. Propodeal spine pointed apically, ca. 3–3.5 times as long as diameter of propodeal spiracle. Petiole in profile cuneiform, ca. 1.0–1.1 times as long as postpetiole (excluding helcium); petiolar node in posterior view slightly emarginate at apex. Postpetiole in dorsal view subpentagonal, ca. 2.3 times as broad as petiolar node. Frons and upper frons rugoso-reticulate, with weakly punctured enclosures; anterolateral face of head reticulate; occipital lobe largely smooth and shining; promesonotum largely smooth and shining but with several transverse rugae dorsally; mesopleuron and lateral face of propodeum weakly punctured; petiole excluding its weakly punctured lateral face, postpetiole and gaster smooth and shining.

*Minor* (paralectotypes). Measurements: HL 0.63–0.65 mm; HW 0.51–0.52 mm; SL 0.82–0.83 mm; AL 0.90–0.95 mm; FL 0.86–0.87 mm; CI 80–81; SI 160–163; FI 165–171. Head in full-face view elliptical (Fig. 11D); occipital carina distinctly flanged. Clypeus without a median longitudinal carina. Eyes situated just in front of midlength of head. Frontal carina and antennal scrobe present only around antennal insertion. Antenna with 3-segmented club; in full-face view scape extending beyond posterior border of head by more than its 1/3 length; terminal segment ca. 0.8 times as long as preceding two segments together. Promesonotum forming a dome, with a low protuberance on each shoulder, with a prominence on its posterior declivity (Fig. 11E). Mesopleuron without a transverse impression. Propodeal spine elongate triangular, 3–3.5 times as long as diameter of propodeal spiracle. Petiole in profile cuneiform, ca. 1.1 times as long as postpetiole (excluding helcium); petiolar node low, in posterior view



**Fig. 11.** Lectotype and paralectotype of *Pheidole plinii* Forel: A, major, head in full-face view; B, same, head in profile; C, same, alitrunk and waist in profile; D, minor, head in full-face view; E, same, alitrunk in profile.

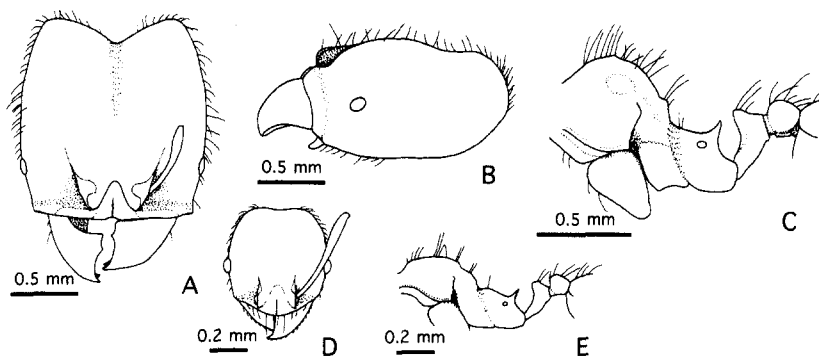
not emarginate at apex. Postpetiole ca. 2.0 times as broad as petiolar node. Head and promesonotum smooth and shining; mesopleuron and propodeum weakly punctured; petiole excluding its weakly punctured sides, postpetiole and gaster smooth and shining.

### ***Pheidole rabo* Forel**

(Fig. 12A–E)

*Pheidole rabo* Forel, 1913, Zool. Jahrb. Abt. Syst. Geogr. Biol. Tiere 36: 28, major, minor and queen; type locality: Sumatra. Six syntypes (2 majors, 2 minors and 2 queens, MHN) were examined, of which one major is designated as the **lectotype**.

*Major* (lectotype and paralectotype). Measurements: HL 1.45–1.53 mm; HW 1.33–1.35 mm; SL 0.58–0.60 mm; FL 0.81–0.85 mm; CI 88–92; SI 44; FI 68–70. Head broadest at about its midlength (Fig. 12A), in profile weakly impressed on vertex (Fig. 12B); anteroventral margin of cranium bearing a pair of stout median processes. Eye situated at about 3/10 distance of head (from anterior margin of clypeus to posterior margin of occipital lobe). Frontal carina and antennal scrobe present only around antennal insertion. Antenna with a 3-segmented club; scape reaching at most midlength of head; terminal segment 1.1–1.2 times as long as preceding two segments together. Masticatory margin of mandible with apical and preapical teeth, and a distinct denticle in front of basal angle. Promesonotum forming a high dome, in profile with a slight prominence on its posterior declivity (Fig. 12C); dorsal portion of the dome somewhat angularly produced laterally. Mesopleuron with a weak transverse impression. Propodeal spine elongate-triangular, ca. 3.5 times as long as diameter of propodeal spiracle. Petiolar node high, in posterior view slightly emarginate at apex. Postpetiole ca. 1.8 times as broad as petiolar node, angulate laterally. Frons longitudinally rugose, with very weakly punctured interspaces; dorsal and dorsolateral faces of occipital lobe reticulate, with very weakly punctured enclosures; lateral face of occipital lobe weakly rugoso-reticulate, but partly smooth and shining; promesonotum in dorsal view irregularly reticulate, with enclosures very weakly punctured and weakly shining; lower part of mesopleuron smooth



**Fig. 12.** Lectotype and paralectotypes of *Pheidole rabo* Forel: A, major, head in full-face view; B, same, head in profile; C, same, alitrunk and waist in profile; D, minor, head in full-face view; E, same, alitrunk and waist in profile.

and shining; propodeum, petiole and postpetiole almost punctured. Gaster almost smooth and shining.

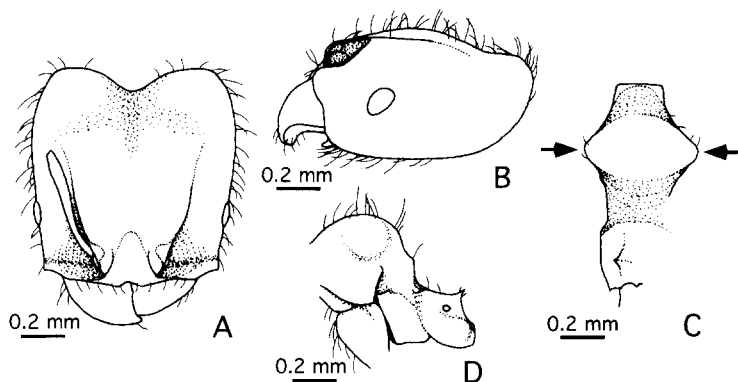
*Minor* (paralectotypes). Measurements: HL 0.58–0.59 mm; HW 0.52 mm; SL 0.53–0.54 mm; AL 0.75–0.79 mm; FL 0.59 mm; CI 88–90; SI 102–104; FI 113. Head in full-face view slightly concave posteriorly (Fig. 12D); occipital carina evanescent dorsally on the head. Eye situated just in front of midlength of head. Antenna with 3-segmented club; in full-face view scape slightly extending beyond posterior border of head; terminal segment 1.1 times as long as preceding two segments together. Promesonotum in profile weakly convex dorsally, with a weak impression on its posterior declivity (Fig. 12E). Mesopleuron without a transverse impression. Propodeal spine relatively slender, ca. 3.5 times as long as diameter of propodeal spiracle. Petiole with long pedicel; petiolar node conspicuous, apically blunt in profile and not emarginate in posterior view. Postpetiole in dorsal view subhexagonal, ca. 1.4 times as broad as petiolar node. Dorsal and lateral faces of head, and dorsal face of promesonotum weakly reticulate, with punctured enclosures; the remainder of alitrunk and at least petiolar pedicel distinctly punctured; gaster smooth and shining over the surface.

### ***Pheidole rinae* Emery**

(Fig. 13A–D)

*Pheidole rinae* Emery, 1900, Ann. Mus. Civ. Stor. Nat. (2) 20 [40]: 687, major; type locality: Siboga, Sumatra. One syntype (major, MCSN) was examined, and is designated as the **lectotype**.

*Major* (lectotype). HL 0.99 mm; HW 0.91 mm; SL 0.47 mm; PW 0.46 mm; FL 0.63 mm; CI 92; SI 52; FI 69. Head broadest at 3/5 distance of head (from anterior margin of clypeus to posterior margin of occipital lobe) (Fig. 13A); head in profile impressed on vertex (Fig. 13B); anteroventral margin of cranium bearing 3 median processes. Clypeus without a median longitudinal carina. Eye situated at about 1/3 distance of head; distance between mandibular insertion and lower margin of eye 1.3 times as long as maximal diameter of eye. Frontal carina weak, extending to about 3/5 distance of head. Antennal scrobe present only around antennal insertion. Masticatory margin of mandible with apical and preapical tooth,



**Fig. 13.** Lectotype of *Pheidole rinae* Emery: A, major, head in full-face view; B, same, head in profile; C, same, alitrunk in dorsal view; D, same, alitrunk in profile.

and a distinct denticle in front of basal angle. Antenna with 3-segmented club; scape reaching about 2/3 distance of head; terminal segment ca. 1.2 times as long as preceding two segments together. Promesonotum forming a high dome, in profile with an inconspicuous prominence on its posterior declivity (Fig. 13D); dorsal portion of the dome weakly produced laterally (arrow in Fig. 13C). Mesopleuron with an inconspicuous transverse impression. Propodeal spine triangular, ca. 3 times as long as diameter of propodeal spiracle. Petiole ca. 1.7 times as long as postpetiole; petiolar node in posterior view weakly emarginate at apex. Postpetiole 1.7 times as broad as petiolar node. Frons longitudinally rugose, with interspaces smooth and shining; dorsal face of occipital lobe reticulate, with enclosures punctured slightly but shining; narrow area below frontal carina weakly punctured; lateral face of head behind eye weakly rugose-reticulate and weakly shining; dorsal face of promesonotum rugose-reticulate, with very weakly punctured enclosures; lateral face of promesonotum largely smooth and shining; the remainder of alitrunk, and petiole and postpetiole weakly punctured and dull; gaster smooth and shining.

*Remarks.* See under *P. rinae taipoana* Wheeler and *P. simoni* Emery.

#### ***Pheidole rinae hongkongensis* Wheeler**

*Pheidole rinae* subsp. *hongkongensis* Wheeler, 1928, Boll. Lab. Zool. Gen. Agrar. R. Sc. Super. Agric. 22: 11, major, minor and queen; type locality: Hong Kong. Seven syntypes (3 majors, 2 minors and 2 queens, MCZ: cotype-20668) were examined, of which one major is designated as the **lectotype**.

*Remarks.* See under *P. rinae taipoana* Wheeler.

#### ***Pheidole rinae taipoana* Wheeler**

*Pheidole rinae* subsp. *taipoana* Wheeler, 1928, Boll. Lab. Zool. Gen. Agrar. R. Sc. Super. Agric. 22: 12, major and minor; type locality: Taipo [New Territory, Hong Kong]. Eight syntypes (3 majors and 5 minors, MCZ: cotype-20670) were examined, of which one major is designated as the **lectotype**.

*Remarks.* The taxonomic status of *P. rinae* (sensu Emery), *P. r. hongkongensis* and *P. r. taipoana* will be discussed in a separate paper with further examination of additional specimens from various localities. However, at least *P. r. hongkongensis* and *P. r. taipoana* may be different from each other at species level, because they are morphologically distinguishable from each other, and occur sympatrically in Macau.

#### ***Pheidole sarawakana* Forel stat. nov.**

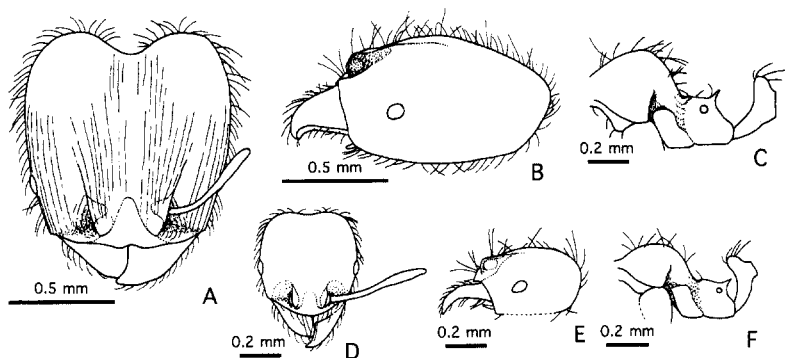
(Figs. 14A–F)

*Pheidole sauberi* subsp. *sarawakana* Forel, 1911a. Rev. Suisse Zool. 19: 45, major and minor; type locality: Sarawak, Borneo. Six syntypes (3 majors and 3 minors, MHN) were examined, of which one major is designated as the **lectotype**.

*Major* (lectotype and paralectotypes). Measurements: HL 1.00–1.05 mm; HW 0.93–0.98 mm; SL

0.52 mm; FL 0.63 mm; CI 93; SI 53–56; FI 64–68. Head broadest at about 2/3 distance of head (from anterior margin of clypeus to posterior margin of occipital lobe) (Fig. 14A), in profile not impressed on vertex (Fig. 14B); anteroventral margin of cranium bearing a pair of median processes. Clypeus without a median longitudinal carina. Eye situated at about 1/3 distance of head; distance between mandibular insertion and anterior margin of eye 1.8–1.9 times as long as maximal diameter of eye (Fig. 14B). Frontal carina inconspicuous, extending to about midlength of head. Antennal scrobe present only around antennal insertion. Antenna with a 3-segmented club; scape reaching about 3/5 distance of head; terminal segment 1.2–1.3 times as long as preceding two segments together. Masticatory margin of mandible with apical and preapical teeth, and a distinct denticle in front of basal angle. Promesonotum forming a high dome, without a prominence on its posterior declivity (Fig. 14C); dorsal portion of the dome not produced laterally. Mesopleuron divided into two parts; the lower part distinctly marginate dorsally (Fig. 14C). Propodeal spine elongate-triangular or horn-like, ca. 2 times as long as diameter of propodeal spiracle. Petiole ca. 1.9 times as long as postpetiole (excluding helcium); petiolar node high (Fig. 14C), in posterior view not emarginate at apex. Postpetiole high, ca. 1.4 times as broad as petiolar node. Anterior 2/3 of dorsum of head longitudinally rugose, with interspaces smooth and shining; the remainder of dorsum of head smooth and shining (Fig. 14A); alitrunk largely smooth and shining; petiolar pedicel very weakly punctured laterally; the remainder of petiole, and postpetiole and gaster smooth and shining. Body light brown.

*Minor* (paralectotypes). Measurements: HL 0.52 mm; HW 0.48–0.49 mm; SL 0.48 mm; AL 0.68 mm; FL 0.50–0.51 mm; CI 92–94; SI 98–100; FI 104. Head in full-face view slightly emarginate posteriorly (Fig. 14D); occipital carina evanescent dorsally on the head. Clypeus without a median longitudinal carina. Eye situated just in front of midlength of head; distance between mandibular insertion and anterior margin of eye 1.1–1.2 times as long as maximal diameter of eye (Fig. 14E). Antenna with 3-segmented club; in full-face view scape extending beyond posterior border of head by its 1/6 length; terminal segment 1.1–1.2 times as long as preceding two segments together. Promesonotum weakly convex dorsally, without any prominence on its posterior declivity (Fig. 14F). Mesopleuron divided into two parts;



**Fig. 14.** Lectotype and paralectotypes of *Pheidole sauberi* subsp. *sarawakana* Forel: A, major, head in full-face view; B, same, head in profile; C, same, alitrunk and waist in profile; D, minor, head in full-face view; E, same, head in profile; F, same, alitrunk and waist in profile.



the lower part distinctly marginate dorsally (Fig. 14F). Propodeal spine triangular, ca. 2 times as long as diameter of propodeal spiracle. Petiole 1.9–2 times as long as postpetiole (excluding helcium); petiolar node high, in posterior view not emarginate apically. Postpetiole high, ca. 1.3 times as broad as petiolar node. Head and promesonotum smooth and shining; the remainder of alitrunk, and petiole and postpetiole largely smooth and shining; gaster smooth and shining. Body light brown.

*Remarks.* Based upon the examination of the syntypes and additional material, *P. s. sarawakana* Forel are easily distinguished from *Pheidole sauberi* Forel by the following characteristics: dorsum of head of the major smooth and shining on posterior 1/3 of head (including occipital lobe) in the former, while longitudinally rugose except for occipital lobe in the latter; eye of the major smaller (distance between mandibular insertion and anterior margin of eye 1.8–1.9 times as long as maximal diameter of eye) in the former than in the latter (ca. 1.6 times). Because these two forms are sympatric in Poring and Danam Valley (N. Borneo), and Bogor (Java), I conclude that they are distinct biological species.

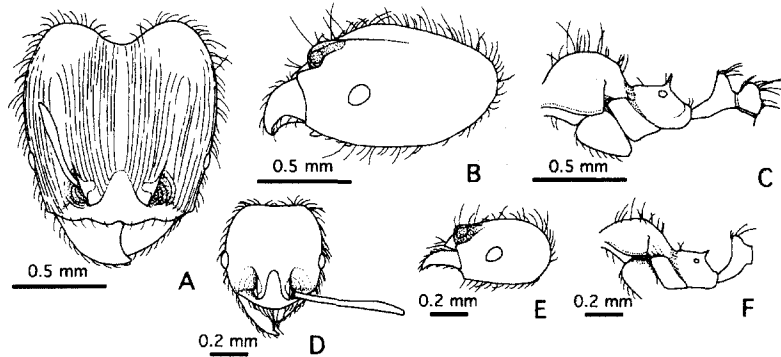
*Pheidole sarawakana* are separated from *P. elisae nenia* Forel by the relatively small eye size (distance between mandibular insertion and anterior margin of eye 1.8–1.9 times as long as maximal diameter of eye in the major of the former, while 1.5–1.6 times in that of the latter), and these two forms are sympatric and well distinguishable in Poring and Danum Valley (N. Borneo). But *P. elisae elisae* Emery seems to be somewhat intermediate between *P. sarawakana* and *P. elisae nenia*. Therefore this problem should be solved with additional specimens from various localities.

### ***Pheidole sauberi* Forel**

(Fig. 15A–F)

*Pheidole sauberi* Forel, 1905, Jahrb. Hambg. Wiss. Anst. 22: 18, major and minor; type locality: Bogor, Java. Three syntypes (1 major and 2 minors, MHN) were examined, of which the major is designated as the **lectotype**.

*Major* (lectotype). Measurements: HL 1.08 mm; HW 1.02 mm; SL 0.54 mm; FL 0.70 mm; CI 94; SI 53; FI 69. Head broadest at about 3/5 distance of head (from anterior margin of clypeus to posterior margin of occipital lobe) (Fig. 15A), in profile not impressed on vertex (Fig. 15B); anteroventral margin of cranium bearing a pair of median processes. Clypeus without a median longitudinal carina. Eye situated just about 1/3 distance of head; distance between mandibular insertion and anterior margin of eye ca. 1.6 times as long as maximal diameter of eye (Fig. 15B). Frontal carina inconspicuous, extending to about 2/3 distance of head. Antennal scrobe present only around antennal insertion. Antenna with 3-segmented club; scape reaching about 3/5 distance of head; terminal segment ca. 1.3 times as long as preceding two segments together. Masticatory margin of mandible with apical and preapical teeth, and a distinct denticle in front of basal angle. Promesonotum forming a high dome, in profile without a prominence on its posterior declivity (Fig. 15C); dorsal portion of the dome not produced laterally. Mesopleuron divided into two parts; the lower part distinctly marginate dorsally (Fig. 15C). Propodeal spine horn-like, ca. 3 times as long as diameter of propodeal spiracle. Petiole ca. 2 times as long as postpetiole (excluding helcium); petiolar node high (Fig. 15C), in posterior view not emarginate at apex. Postpetiole high, ca. 1.5 times as broad as petiolar node. Dorsum of head longitudinally rugose except



**Fig. 15.** Lectotype and paralectotypes of *Pheidole sauberi* Forel: A, major, head in full-face view; B, same, head in profile; C, same, alitrunk and waist in profile; D, minor, head in full-face view; E, same, head in profile; F, same, alitrunk and waist in profile.

for occipital lobe (Fig. 15A), with interspaces smooth and shining; lateral face of occipital lobe smooth and shining; promesonotum smooth and shining, with several transverse rugae dorsally; lower part of mesopleuron, and dorsal and declivitous faces of propodeum smooth and shining; lateral face of propodeum partly rugose and partly punctured weakly, but shining; petiolar pedicel and lateral side of postpetiole weakly punctured; petiolar node, dorsum of postpetiole, and gaster smooth and shining. Body brown.

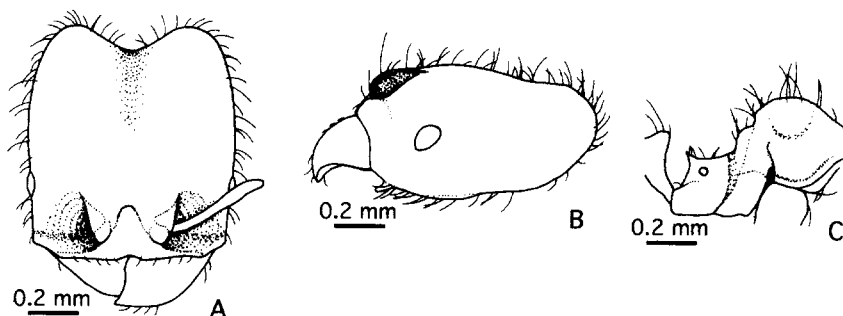
*Minor* (paralectotypes). Measurements: HL 0.56–0.57 mm; HW 0.53–0.54 mm; SL 0.60–0.61 mm; AL 0.73–0.75 mm; FL 0.63–0.65 mm; CI 93–96; SI 111–115; FI 119–120. Head in full-face view almost straight posteriorly (Fig. 15D); occipital carina evanescent dorsally on the head. Clypeus without a median longitudinal carina. Eye situated just in front of midlength of head; distance between mandibular insertion and anterior margin of eye 1.1–1.2 times as long as maximal diameter of eye (Fig. 15E). Antenna with 3-segmented club; in full-face view scape extending beyond posterior border of head by its 1/4 length; terminal segment 1.1–1.2 times as long as preceding two segments together. Promesonotum convex dorsally, without any prominence on its posterior declivity (Fig. 15F). Mesopleuron divided into two parts; the lower part distinctly marginate dorsally. Propodeal spine ca. 1.5 times as long as diameter of propodeal spiracle. Petiole 1.8–1.9 times as long as postpetiole (excluding helcium); petiolar node high (Fig. 15F), in posterior view not emarginate at apex. Postpetiole high, 1.3–1.4 times as broad as petiolar node. Head and promesonotum smooth and shining; the remainder of alitrunk, and petiole and postpetiole largely smooth and shining; gaster smooth and shining. Body light brown.

*Remarks.* The differences between this species and *P. sarawakana* are mentioned above. This species is also easily distinguished from *P. e. elisae* + *P. e. nenia* complex (see under *P. sarawakana*) in which posterior 1/3 of dorsum of head smooth and shining in the major.

### ***Pheidole simoni* Emery**

(Fig. 16A–C)

*Pheidole simoni* Emery, 1893, Ann. Soc. Entomol. Fr. 62: 266, major; type locality: Manilla [Manila, Philippines]. One syntype (major, MCSN) was examined, and is designated as the **lectotype**.



**Fig. 16.** Lectotype of *Pheidole simoni* Emery: A, major, head in full-face view; B, same, head in profile; C, same, alitrunk in profile.

*Major* (lectotype). HL 1.00 mm; HW 0.84 mm; SL 0.43 mm; FL 0.55 mm; CI 84; SI 51; FI 65. Head in full-face view broadest at about  $3/5$  distance of head (from anterior margin of clypeus to posterior margin of occipital lobe) (Fig. 16A), in profile with an inconspicuous impression on vertex (Fig. 16B); anteroventral margin of cranium bearing 3 median processes (median one lowest). Clypeus with an evanescent median longitudinal carina. Eye situated at about  $1/3$  distance of head; distance between mandibular insertion and anterior margin of eye ca. 1.6 times as long as maximal diameter of eye. Frontal carina and antennal scrobe present only around antennal insertion. Masticatory margin of mandible with apical and preapical tooth, and a distinct teeth in front of basal angle. Antenna with a 3-segmented club; terminal segment ca. 1.2 times as long as preceding two segments together. Promesonotum forming a high dome, in profile with a distinct prominence on its posterior declivity (Fig. 16C); dorsal portion of the dome weakly produced laterally. Mesopleuron with a slight transverse impression; lower part of mesopleuron slightly marginate dorsally. Propodeal spine triangular, ca. 2 times as long as diameter of propodeal spiracle. Petiole ca. 1.8 times as long as postpetiole; petiolar node high, in posterior view not emarginate at apex. Postpetiole ca. 1.6 times as broad as petiolar node, angulate laterally. Frons and gena longitudinally rugose, with very weakly punctured enclosures; dorsal face of occipital lobe reticulate, with enclosures punctured weakly and dull; dorsolateral part of head above eye punctured and dull; lateral face of occipital lobe rugose, with interspaces smooth and shining; dorsal face of promesonotum slightly reticulate, with enclosures punctured and dull; the remainder of alitrunk largely punctured and weakly shining; dorsum of petiolar pedicel smooth and shining; the remainder of petiole, and postpetiole punctured and weakly shining; gaster smooth and shining.

*Remarks.* This species is very similar to *P. rinae* Emery, but distinguished from the latter by the dorsal outline of head in profile, condition of frontal carina, and sculpture of dorsum of head and lateral face of promesonotum.

### ***Pheidole tandjongensis* Forel**

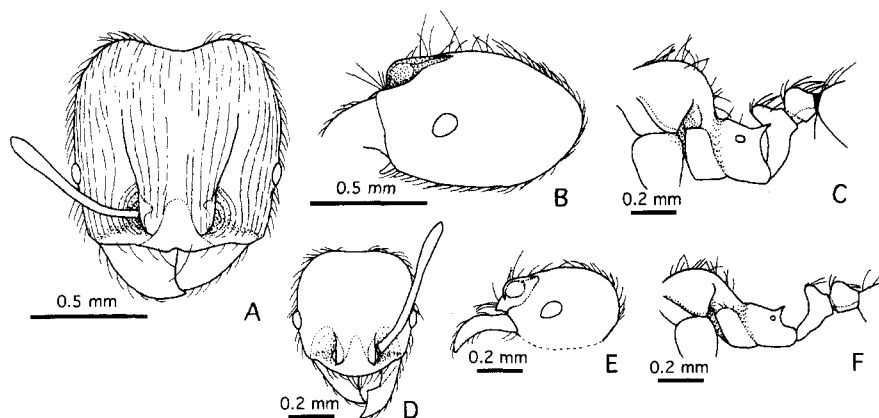
(Fig. 17A–F)

*Pheidole tandjongensis* Forel, 1913, Zool. Jahrb. Abt. Syst. Geogr. Biol. Tiere 36: 42, major and minor; type locality: Tanjong Slammat, Sumatra. Four syntypes (1 major and 3 minors, MHN) were

examined, of which the major is designated as the **lectotype**.

**Major (lectotype).** Measurements: HL 0.94 mm; HW 0.89 mm; SL 0.66 mm; FL 0.57 mm; CI 95; SI 74; FI 64. Head broadest at about  $3/5$  distance of head (from anterior margin of clypeus to posterior margin of occipital lobe) (Fig. 17A), in profile not impressed on vertex (Fig. 17B); occipital lobe ill developed (Fig. 17A); anteroventral margin of cranium bearing a pair of long median processes. Clypeus without a median longitudinal carina. Eye 0.13 mm in maximal diameter, situated at about  $2/5$  distance of head; distance between mandibular insertion and anterior margin of eye 1.5 times as long as maximal diameter of eye (Fig. 17B). Frontal carina very weak, extending to about  $4/5$  distance of head. Antennal scrobe present only around antennal insertion. Antenna with 3-segmented club; scape reaching about  $4/5$  distance of head; terminal segment ca. 1.1 times as long as preceding two segments together. Masticatory margin of mandible with apical and preapical teeth, and an indistinct denticle in front of basal angle. Promesonotum forming a high dome, without a prominence on its posterior declivity (Fig. 17C); dorsal portion of the dome not produced laterally. Mesopleuron divided into two parts; the lower part distinctly marginate dorsally (Fig. 17C). Propodeal spine horn-like, ca. 1.5 times as long as diameter of propodeal spiracle. Petiole ca. 1.9 times as long as postpetiole (excluding helcium); petiolar node high, in posterior view not emarginate at apex (Fig. 17C). Postpetiole high, ca. 1.3 times as broad as petiolar node. Dorsum of head almost entirely rugose (Fig. 17A), with interspaces smooth and shining; lateral face of occipital lobe smooth and shining; alitrunk largely smooth and shining; petiolar pedicel very weakly punctured; the remainder of petiole, and postpetiole and gaster smooth and shining. Body light brown.

**Minor (paralectotypes).** Measurements: HL 0.54–0.56 mm; HW 0.51–0.52 mm; SL 0.58–0.61 mm; AL 0.70–0.73 mm; FL 0.57–0.61 mm; CI 91–96; SI 112–117; FI 110–117. Head in full-face view almost straight posteriorly (Fig. 17D); occipital carina evanescent dorsally on the head. Clypeus without a median longitudinal carina. Eye situated at about midlength of head; distance between mandibular



**Fig. 17.** Lectotype and paralectotypes of *Pheidole tandjongensis* Forel: A, major, head in full-face view; B, same, head in profile; C, same, alitrunk and waist in profile; D, minor, head in full-face view; E, same, head in profile; F, same, alitrunk and waist in profile.

insertion and anterior margin of eye 1.0–1.1 times as long as maximal diameter of eye (Fig. 17E). Antenna with 3-segmented club; in full-face view scape extending beyond posterior border of head by its 1/4 length; terminal segment 1.0–1.1 times as long as preceding two segments together. Promesonotum weakly convex dorsally, without any prominence on its posterior declivity (Fig. 17F). Mesopleuron divided into two parts; the lower part distinctly marginate dorsally. Propodeal spine ca. 1.5 times as long as diameter of propodeal spiracle. Petiole 1.9–2 times as long as postpetiole (excluding helcium); petiolar node high, in posterior view not emarginate at apex. Postpetiole high, ca. 1.3 times as broad as petiolar node. Head smooth and shining; alitrunk largely smooth and shining; petiolar pedicel very weakly punctured, but shining; the remainder of petiole, and postpetiole and gaster smooth and shining. Body light brown.

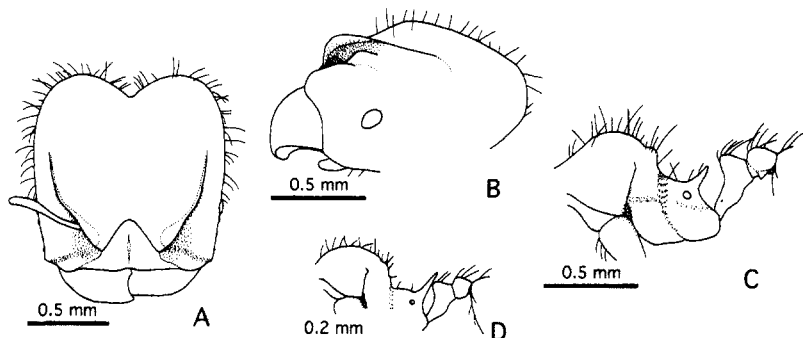
***Pheidole tjibodana* Forel, stat. nov.**

(Figs. 18A–D)

*Pheidole nodgii* var. *tjibodana* Forel, 1905, Jahrb. Hambg. Wiss. Anst. 22: 16, major, minor and queen; type locality: Cibodas, Java. Three syntypes (1 major, 1 minor and 1 queen, MHN) were examined, of which the major is designated as the **lectotype**.

*Major* (lectotype). Measurements: HL 1.23 mm; HW 1.18 mm; SL 0.56 mm; FL 0.66 mm; CI 96; SI 47; FI 56. Head with almost parallel sides, or broadest at about 2/3 distance of head (from anterior margin of head to posterior margin of occipital lobe) (Fig. 18A); head in profile distinctly convex on upper frons; the declivity from upper frons toward occipital lobe not concave (Fig. 18B); anteroventral margin of cranium with a large median process. Clypeus with a weak median carina. Eye situated at about 1/3 distance of head. Frontal carina distinct, horizontally flanged, extending to 2/3 distance of head. Antennal scrobe deeply excavated under frontal carina. Frontal lobe well developed, suberect. Antenna with 3-segmented club; scape reaching about 3/5 distance of head (Fig. 18A); terminal segment ca. 1.3 times as long as preceding two segments together. Masticatory margin of mandible with apical and preapical teeth, and an indistinct denticle in front of basal angle. Promesonotum forming a dome, in profile (Fig. 18C) with a low prominence on its posterior declivity; dorsal portion of the dome weakly produced laterally. Mesopleuron with a weak transverse impression. Propodeal spine horn-like, ca. 3.5 times as long as diameter of propodeal spiracle. Petiole ca. 2.0 times as long as postpetiole (excluding helcium), with a long petiolar peduncle; petiolar node distinct, in posterior view hardly emarginate at apex. Postpetiole ca. 1.4 times as broad as petiole, angulate laterally. Frons longitudinally rugose, with very weakly punctured interspaces; dorsal and dorsolateral faces of occipital lobe reticulate, with punctured and dull enclosures; antennal scrobe punctured and dull; promesonotum weakly reticulate dorsally, with punctured and dull enclosures; the lower part of mesopleuron at most partly smooth and shining; the remainder of alitrunk punctured and dull; petiolar pedicel and ventrolateral side of postpetiole punctured and dull; the remainder of petiole and postpetiole smooth and shining; first gastral tergite weakly punctured around its articulation with postpetiole.

*Minor* (paralectotype). Measurements: HL 0.57 mm; HW 0.57 mm; SL 0.48 mm; AL 0.75 mm; FL 0.52 mm; CI 100; SI 84; FI 91. Head in full-face view straight or weakly concave posteriorly; occipital



**Fig. 18.** Lectotype and paralectotype of *Pheidole nodgii* var. *tjibodana* Forel: A, major, head in full-face view; B, same, head in profile; C, same, alitrunk and waist in profile; D, same, alitrunk and waist in profile.

carina evanescent dorsally on the head. Clypeus occasionally with an evanescent median longitudinal carina. Eyes situated just in front of midlength of head. Frontal carina and antennal scrobe present only around antennal insertion. Antenna with 3-segmented club; terminal segment ca. 1.3 times as long as preceding two segments together. Promesonotum forming a dome with an inconspicuous tubercle in each dorsolateral portion; posterior declivity toward metanotal groove very steep or almost vertical (Fig. 18D). Mesopleuron without transverse impression. Propodeal spine horn-like, straight, ca. 5 times as long as diameter of propodeal spiracle. Petiole ca. 1.9 times as long as postpetiole (excluding helcium); petiolar node distinct, in posterior view not emarginate at apex. Postpetiole ca. 1.3 times as broad as petiole. Dorsal face of head and promesonotum weakly reticulate, with punctured and dull enclosures; lateral face of head and the remainder of alitrunk punctured and dull; petiole weakly punctured; postpetiole and gaster smooth and shining.

*Remarks.* Based upon the examination of types and additional material, "*P. n. tjibodana* Forel" is easily distinguished from *Pheidole nodgii* Forel by the following characteristics: upper frons of the major higher in the former than in the latter; in the minor the declivity from promesonotum to metanotal groove steeper (almost vertical) in the former than in the latter. Because these two forms are almost sympatric around Bogor, they are considered to be distinct biological species.

### ***Pheidole tsailuni* Wheeler**

(Figs. 19A–D, cf. Fig. 19E)

*Pheidole concinna* Wheeler, 1928, Boll. Lab. Zool. Gen. Agrar. Portici 22: 13, major and minor; type locality: Laockoy, Indochina. Eight syntypes (2 majors and 6 minors, MCZ: cotype-20656) were examined, of which one major is designated as the **lectotype**.

*Pheidole tsailuni* Wheeler, 1929, Amer. Mus. Nat. Hist. Novitates 361: 2. Replacement name for *Pheidole concinna*.

*Major* (lectotype and paralectotype). Measurements: HL 1.09–1.11 mm; HW 0.99–1.02 mm; SL 0.50–0.51 mm; FL 0.66 mm; CI 91–92; SI 50–51; FI 68. Head broadest at about 3/5 distance of head

(from anterior margin of clypeus to posterior margin of occipital lobe) (Fig. 19A), in profile not impressed on vertex (Fig. 19B); anteroventral margin of cranium bearing a pair of stout median processes. Eye situated at about 1/3 distance of head. Frontal carina and antennal scrobe present only around antennal insertion. Antenna with 3-segmented club; antennal scape reaching about midlength of head; terminal segment ca. 1.1 times as long as preceding two segments together. Masticatory margin of mandible with apical and preapical teeth, and a distinct denticle in front of basal angle. Promesonotum forming a high dome, with an inconspicuous prominence on its posterior declivity; dorsal portion of the dome somewhat angularly produced laterally. Propodeal spine digitiform, 3–3.5 times as long as diameter of propodeal spiracle. Petiole ca. 1.7 times as long as postpetiole (excluding helcium); petiolar node high, in posterior view not emarginate at apex. Postpetiole ca. 1.5 times as broad as petiolar node, produced laterally. Frons longitudinally rugose, with interspaces punctured and dull; dorsal and dorsolateral faces of occipital lobe reticulate, with enclosures punctured and dull; lateral face of occipital lobe weakly rugoso-reticulate and dull; alitrunk, petiole and postpetiole distinctly punctured. First gastral tergite longitudinally rugose, and punctured around its articulation with postpetiole.

**Remarks.** The six minors (paralectotypes) mounted on two pins are almost of the same size, but actually include the following three species. Three specimens of sp. A are mounted on a pin, and one specimen of sp. B and two specimens of sp. C on the other pin.

**Species A.** Three minors with punctured body and smaller eyes: head and alitrunk punctured; eye smaller (0.08 mm in maximal diameter), and distance between mandibular insertion and anterior margin of eye ca. 1.2 times as long as maximal diameter of eye; promesonotal dome in profile slightly convex above, with a weak prominence on its posterior declivity (arrow in Fig. 19D).

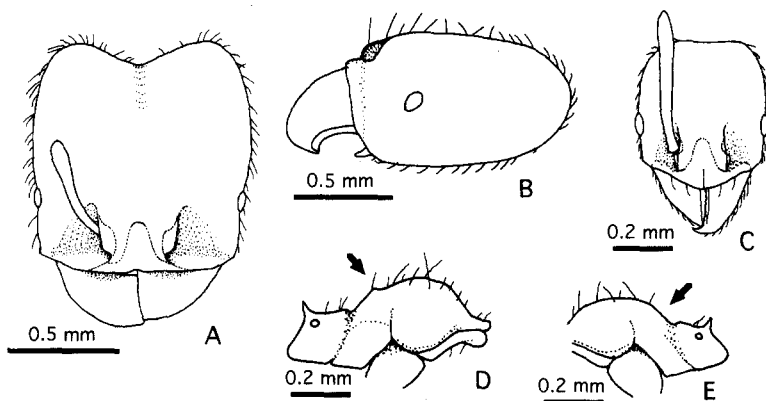
**Species B.** One minor with a punctured body and larger eyes: head and alitrunk punctured; eye larger (slightly less than 0.09 mm in maximal diameter), and distance between mandibular insertion and anterior margin of eye almost as long as maximal diameter of eye; dorsal outline of promesonotal dome in profile almost straight, without any prominence on its posterior declivity (arrow in Fig. 19E). This minor is mounted on a pin together with sp. C.

**Species C.** Two minors with the head and promesonotum completely smooth and shining.

According to Wheeler's original description, head and alitrunk of the minor of *P. tsailuni* punctured, suggesting that sp. A or sp. B is the true *P. tsailuni*. Judging from the major-minor combination of a *P. tsailuni* colony (colony code: Eg99-VN-122, Ba Vi. N. P. (ca. 400–800 m alt.), Ha Tai prov., N. Vietnam, K. Eguchi leg., 1999), sp. A is most probably the minor of *P. tsailuni*.

Redescription of the minor is given below based on the three minors referred to as sp. A.

**Minor (sp. A).** Measurements: HL 0.50–0.51 mm; HW 0.43 mm; SL 0.45–0.46 mm; AL 0.65 mm; FL 0.48 mm; CI 86; SI 107; FI 112. Head in full-face view slightly concave posteriorly (Fig. 19C); occipital carina evanescent dorsally on the head. Eye 0.08 mm in its maximal diameter, situated just in front of midlength of head; distance between mandibular insertion and anterior margin of eye 1.2 times as long as maximal diameter of eye. Antenna with 3-segmented club; in full-face view scape extending beyond posterior border of head by a little more than its 1/5 length; terminal segment ca. 1.1 times as long as preceding two segments together. Promesonotum in profile weakly convex dorsally, with a weak prominence on its posterior declivity (arrow in Fig. 19D). Mesopleuron without a distinct transverse



**Fig. 19.** Lectotype and paralectotypes of *Pheidole tsailuni* Wheeler: A, major, head in full-face view; B, same, head in profile; C, minor ("sp. A"), head in full-face view; D, same, alitrunk in profile; E, minor ("Sp. B"), alitrunk in profile.

impression. Propodeal spine ca. 3.0 times as long as diameter of propodeal spiracle. Petiole ca. 1.8 times as long as postpetiole (excluding helcium), with long pedicel (almost as long as postpetiole); petiolar node conspicuous, in posterior view not emarginate at apex. Postpetiole ca. 1.4 times as broad as petiolar node. Dorsal and lateral faces of head and alitrunk distinctly punctured; petiolar pedicel weakly punctured; gaster smooth and shining.

### ***Pheidole upeneci* Forel**

(Fig. 20A–E)

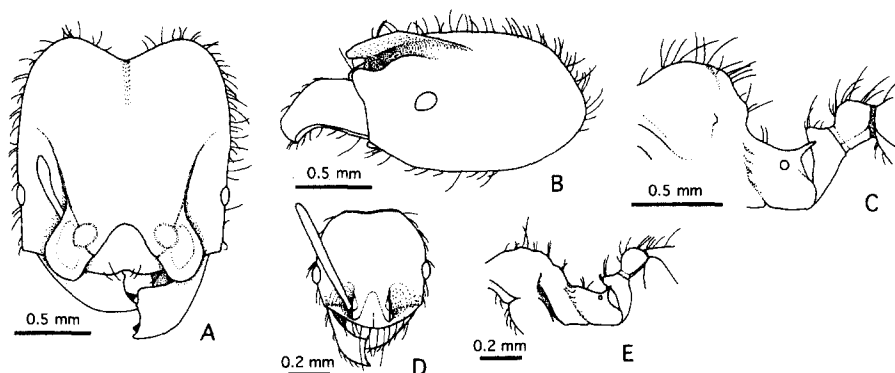
*Pheidole* (*Elasmopheidole*) *upeneci* Forel, 1913, Zool. Jahrb. Abt. Syst. Geogr. Biol. Tiere 36: 43, major and minor, type locality: Cibodas (4500 feet), Java. Four syntypes (1 major and 3 minors, MHN) were examined, of which the major is designated as the **lectotype**.

*Pheidole* (*Stegopheidole*) *upeneci*: Emery, 1915, Bull. Soc. Entomol. Fr. 1915: 190.

*Pheidole upeneci*: Bolton, 1995b, A New General Catalogue of the Ant of the World: 332.

*Major* (lectotype). Measurements: HL 1.55 mm; HW 1.37 mm; SL 0.60 mm; FL 0.93 mm; CI 88; SI 44; FI 68. Head with almost parallel sides (Fig. 20A), in profile not impressed on vertex (Fig. 20B); anteroventral margin of cranium bearing 3 low median processes. Clypeus without a median longitudinal carina. Eye situated at about 1/3 distance of head (from anterior margin of clypeus to posterior margin of occipital lobe); distance between mandibular insertion and anterior margin of eye 1.8 times as long as maximal diameter of eye. Frontal carina reaching about 3/5 distance of head. Antennal scrobe present only around antennal insertion. Frontal lobe almost horizontal, extremely developed, extending beyond anterior clypeal margin (Fig. 20A, B). Masticatory margin of mandible with apical and preapical teeth, and a distinct denticle in front of basal angle. Antenna with 3-segmented club; scape reaching about midlength of head; terminal segment almost as long as preceding two segments together. Promesonotum forming a high dome, with an inconspicuous prominence on its posterior declivity (Fig. 20C); dorsal





**Fig. 20.** Lectotype and paralectotypes of *Pheidole upeneci* Forel: A, major, head in full-face view; B, same, head in profile; C, same, alitrunk and waist in profile; D, minor, head in full-face view; E, same, alitrunk and waist in profile.

portion of the dome weakly produced laterally. Propodeal spine horn-like, 3.5 times as long as diameter of propodeal spiracle. Petiole ca. 1.5 times as long as postpetiole (excluding helcium); petiolar node in posterior view distinctly emarginate at apex. Postpetiole ca. 2.0 times as broad as petiolar node, produced laterally. Frons, and lateral face of head in front of eye longitudinally rugose; dorsal and dorsolateral faces of occipital lobe reticulate, with very weakly punctured enclosures; lateral face of occipital lobe weakly rugose but shining, and partly smooth and shining; promesonotum irregularly rugose on its shoulder; the remainder of alitrunk largely smooth and shining; petiolar pedicel weakly punctured and dull; petiolar node smooth and shining; postpetiole irregularly rugose but shining; anterior half of first gastral tergite longitudinally rugose.

*Minor* (paralectotypes). Measurements: HL 0.57–0.59 mm; HW 0.52–0.53 mm; SL 0.58 mm; AL 0.78 mm; FL 0.65 mm; CI 90–91; SI 109–112; FI 123–125. Head in full-face view almost straight posteriorly; occipital carina distinct (Fig. 20D). Clypeus with a weak median longitudinal carina. Eye situated at about midlength of head. Antenna with 3-segmented club; in full-face view scape extending beyond posterior margin of head by its 1/5 length; terminal segment almost as long as preceding two segments together. Promesonotum forming a low dome, with an inconspicuous tubercle in each dorsolateral portion, with an inconspicuous prominence on its posterior declivity (Fig. 20E). Mesopleuron without a transverse impression. Propodeal spine pointed apically, ca. 2–2.5 times as long as diameter of propodeal spiracle. Petiole 1.6–1.7 times as long as postpetiole (excluding helcium). Postpetiole in dorsal view subhexagonal, 1.6–1.7 times as broad as petiolar node. Body largely smooth and shining.

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